ELECTRICAL TIMES

THURSDAY
5 OCT.
1950
SIXPENCE

Specialists in Super-Tension Installations

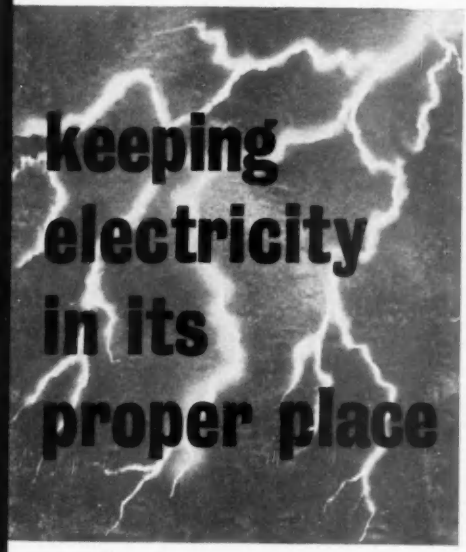
Henley's specialise in the complete manufacture and installation of super-tension cables and accessories and in the erection of overhead transmission lines.

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

HENLEY

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

MICOFLEX-DURATUBE (P.V.C.) EXTRUSIONS



Our P.V.C. extrusions not only keep electricity in its proper place, they are oil-proof, petrol-proof, damp-proof, non-inflammable and proof against certain chemicals. Some of their versatile uses are listed below:—

Micoflex-Duratube, for instance, made in various grades and attractive colours, not only covers wire or groups of wires in radio, radar or sound recorder equipment, it can also convey petrol, oil or acid or alkali fluids, or cover rods and handgrips.

Micoflex-Durasleeve, a P.V.C. covered flexible metal conduit, is used for the leads of electric motors, cookers, wash-boilers etc., and is of special value where cable would normally be exposed to conditions liable to cause deterioration.

Durathread is an insulating thread useful for securing wiring and connections.

Durastrip is widely used as strap handles or carriers for the transportation of portable radios and instruments.

Expansion Joints for Concrete.

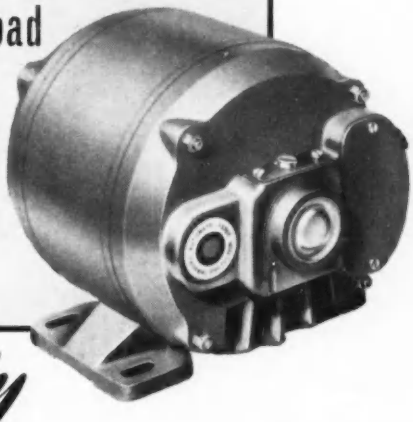
Special Section Extrusions are also available.

THE MICANITE & INSULATORS CO. LTD.
Empire Works, Blackhorse Lane, Walthamstow, London E.17
BRANCH OFFICES at BIRMINGHAM, CARDIFF, GLASGOW, MANCHESTER and NEWCASTLE-UPON-TYNE, and representatives in most countries throughout the world.

Manufacturers of MICANITE *(Built-up Mica Insulation), Fabricated and Processed* MICA, PAXOLIN *Laminated Materials,* PANILAX *Laminated Materials and Mouldings,* EMPIRE *Varnished Insulating Cloths and Tapes.* HIGH VOLTAGE BUSHINGS *and* TERMINALS. *Distributors of Micoflex-Duratube Sleevings and Micoflex-Durasleeve (Plastic-covered flexible metal conduit).*

m and i

FOR
FRACTIONAL DRIVES
where full protection
against overload
and stalling
conditions
is essential



The motor illustrated is fitted with automatic re-set, but manual re-set thermal protectors are also available.

Specify

'ENGLISH ELECTRIC'
fractional horse-power
MOTORS
WITH THERMAL PROTECTION DEVICE

The thermal protection device protects the motor against burn-out of windings under all conditions of overload

The ENGLISH ELECTRIC Company Ltd.
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WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

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Insulation?

A First Class Machine requires First Class Insulation

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IS A SUPERLATIVE INSULATING MEDIUM

SONDAHL

has these special features

ALMOST COMPLETELY NON-TRACKING

TOTALLY NON-HYGROSCOPIC

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Supplied in Sheet, Rod, Tube, or Moulding, it can readily be adapted for any job

Full Particulars and Samples from

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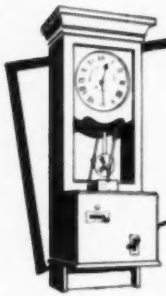
Manufactured solely by

Wallington, Weston & Co. Ltd. . Frome



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An indispensable record of arrival and departures, an automatic and accurate statement of hours worked, and a filed index of wage rates, overtime and other man-hour statistics for the efficient planning of industry. You can get all this on the Gledhill-Brook Recorder.

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and Costing Systems

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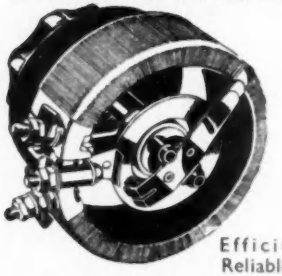

Efficient and Reliable, these instruments are second to none. Our Technical service will be happy to advise you in any difficulty, so do not hesitate to get in touch with us soon.

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registered Trade Name of

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Tower Street, Birmingham 19

Telephone: ASTon Cross 2666 (3 lines). *Telegrams:* "OHMIC" Birmingham

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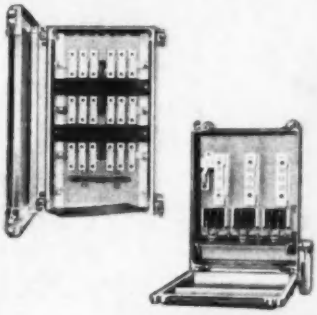

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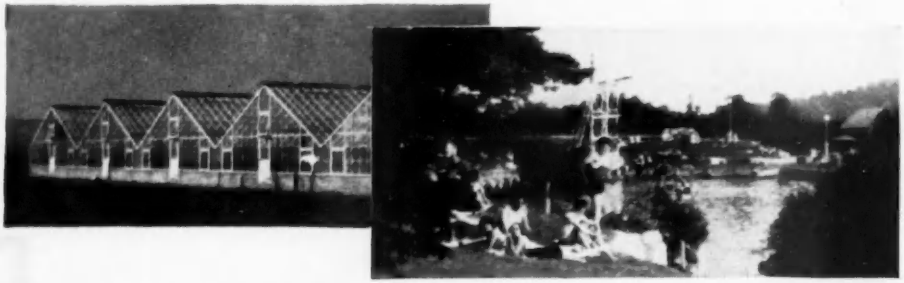
PHONE: BIRCHFIELDS 5011 GRAMS: BILSWITCH BHAM



1912 *The Story of* BELLING *& Company Ltd.* No.14 1950

As the pictures indicate this chapter is a slight diversion from the usual history of Belling & Co., but not entirely unconnected with it.

In *1932* I joined in with Mr. Church (we were together at Cromptons but he had then left them), and set out to manufacture electrical equipment for the horticultural trade such as heaters for glass houses and frames, soil sterilizers and soil warming apparatus. We started a demonstration ground at Witham, on which we showed our various appliances in practical everyday use. We also exhibited at many of the early E.D.A. shows; in Supply Company Showrooms and at the Chelsea Flower Shows.

In this business we found we were once again far too far in advance of the times, and there was too much educational work to be done to get the appliances really moving. Orders were very slow in coming in but in the meantime we had found from our demonstration house there was good money in tomato growing, so we increased our glass houses and turned our demonstration ground into a real commercial nursery — chiefly for tomato production. Fortunately we had bought about 12 acres of land and we now have one of the largest and most efficiently arranged nurseries in our part of Essex. When you are motoring down the East Coast Road look out for it on the left about a mile before reaching Witham. Call in — Mr. Church will be delighted to see you and have a chat and I know will give you a box of the finest tomatoes you have ever tasted. We are still putting up more glasshouses!!

1933. We will now go back to Belling & Co. again. During this year I see we produced our first reflector type fire with a rod type element. We also introduced our New Era Fire and started making inset fires in really large quantities for builders and for fitting into tiled fireplaces.

In this same year we improved our cookers and introduced our No. 43 range. These cookers all had knife blade contacts for the boiling plates, which were very successful, and as a matter of fact we never had a case of the contacts seizing up such as often happens when round pins and sockets are used.

Also in 1933 I see I joined in with Mr. Alderson and Mr. Arnold and formed a small limited company called Knightshades Ltd., to make standard lamps, table lamps, lamp shades and decorative lighting fittings, etc., and this limited company took over and still occupy my old works at Derby Road, Edmonton. Mr. Alderson is our active everyday Director here and keeps things busily moving.

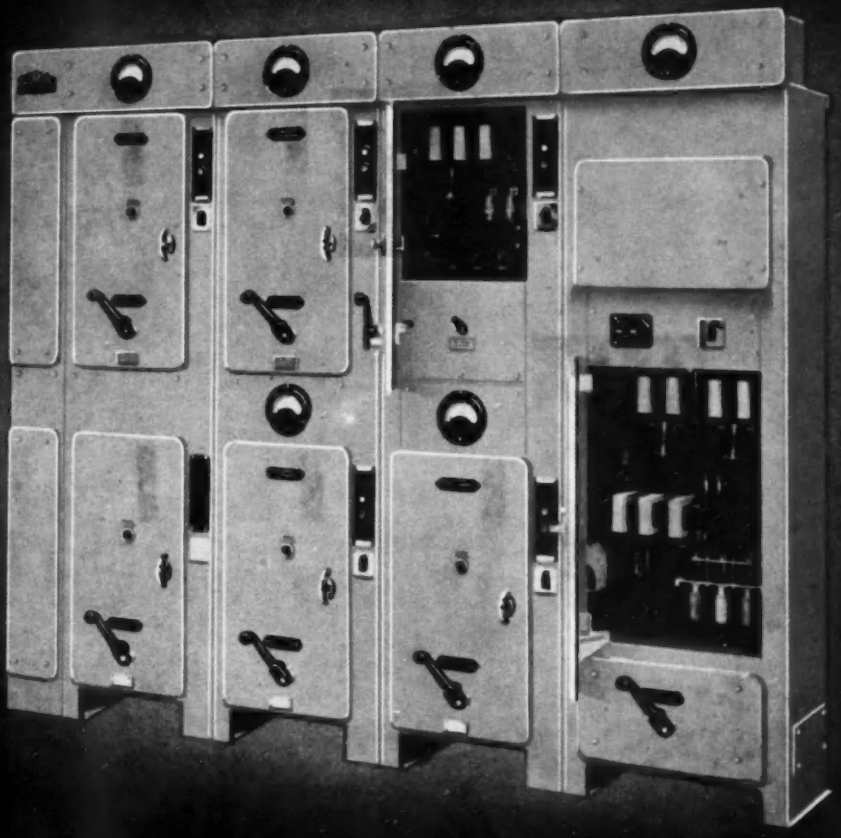
Another side-line Mr. Marques and I joined in with in this same year was the construction of a swimming pool at the back of our concrete works down at Gt. Amwell. Actually we were rather short of work at the time and the finishing off in concrete slabs of this partly natural swimming pool enabled us to keep our leading employees going. This pool was a delightful place and very successful for two or three years. We sometimes had more than a thousand people down there at fine weekends. The catering, however, was a very difficult problem, the maintaining of our water level and keeping the necessary standard of purity of the water was another, and eventually as we got busy with orders again for our own work, we closed the pool down to the public. Actually the swimming pool is now being rapidly absorbed by extensions to our works to meet the demand for our concrete lamp columns.

Returning to Belling & Co. again for 1934, I see that we improved our reflector type fires and added our well-known Solray and Chromray designs. Furthermore, in this particular year we added six more bays (24,000 sq. ft.) to our West Shop for fire and cooker assembly.

Space used up again—next chapter carries on.

C. H. Belling.

motor control gear



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UP TO 660 VOLTS.
IN CUBICLE
PILLAR
OR WALL MOUNTING PATTERNS

the Belmos company limited

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LONDON OFFICE: COLUMBIA HOUSE, ALDWYCH W.C.2

WHY DON'T YOU ASK ME?
Yes! Ask her. Ask your customer what she looks for in a cooker—in addition to the meat ration! B.N.E. asked Supply Authorities serving one and a quarter million consumers what they wanted, and incorporated their requirements in the Model C.49. As a result the specification includes more desirable features than have ever before been built into one cooker, not the least of them being the very attractive appearance . . . . Send for full details now.
★ CAST-IRON MAIN FRAME AND HOB.
★ CONFORMS TO B.S. 1195 AND E.D.A. SPECIFICATION FOR INTERCHANGEABILITY.
★ VERY LARGE OVEN AND HOT-CUPBOARD WITH DROP-DOWN COUNTERBALANCED DOORS.
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★ EASY CONVERSION FROM 2 TO 3 PLATE.
The B.N.E. Model C.49
The Cooker that has everything
BRITISH NATIONAL ELECTRICS LTD.
A Product
THE DOMESTIC APPLIANCES SECTION OF
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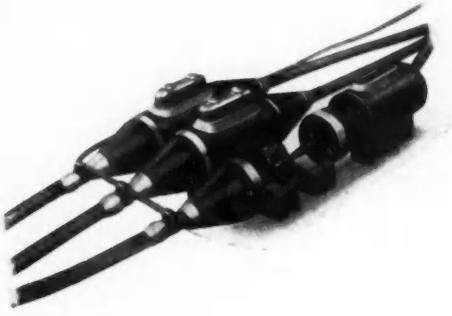
GLOVERS SOLID TYPE
SUPER-TENSION CABLE AND JOINTS

(1) Impregnated with Compounds which are SOLID up to 65° C.

(2) No Excessive Pressure or Vacuum in Service.



(1) SOLID Compound Insulated, Porcelain Spaced, Joints.

(2) No Compound Migration from Joints.

(3) Barrier Joints Unnecessary and Never Used.

W. T. GLOVER & CO. LTD.

TRAFFORD PARK MANCHESTER 17

"Well, phone General Cables"

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The following are available at short notice from Leatherhead, Birmingham, Manchester and Glasgow.
In case of difficulty contact Leatherhead.

V.I.R. Taped, Braided and Compounded.
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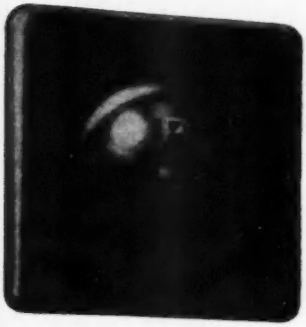
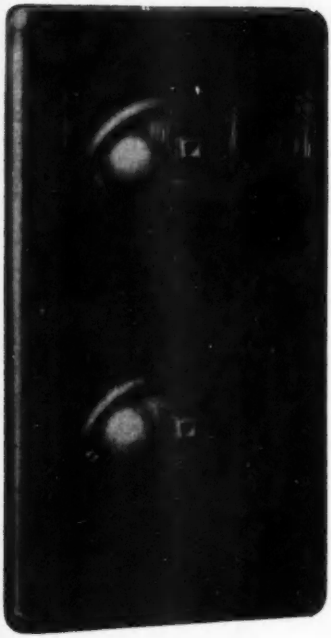
Depots at : 204/206, Newhall Street, Birmingham.
54a, Newton Street, Manchester. 55/63, Washington Street, Glasgow, C.2.

Tenby Pilot

FRIGATE FLUSH ASSEMBLIES





A New Tenby Pilot Switch

Just Tenby Quality at its very best

THE "FRIGATE" combines all the labour-saving features of the TENBY PILOT Range of Accessories; a heavy Moulded Box, Plaster Depth to reduce installation costs; special Easy Wiring Terminals and a Cover of exceptional strength and graceful appearance. In short an extremely robust assembly at a price which enables you to install TENBY quality in the most competitive schemes. We'll be pleased to send you details.

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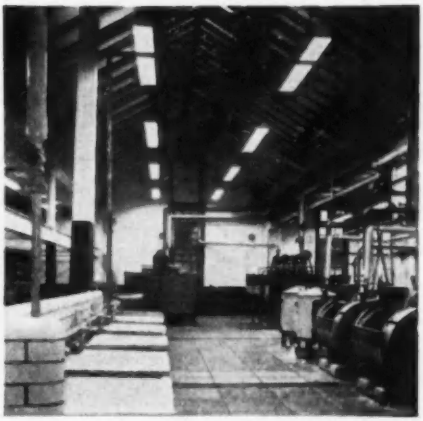

Acknowledgments to:—
Alex. Howden & Co. Ltd.
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for Planned Lighting

Contractors are offered full assistance in the preparation of lighting schemes, including designs, drawings and full-scale testing. Descriptive literature relating to Ekco Fluorescent lamps, lighting fittings and equipment for industrial installations will be sent on application to any of the addresses below:—

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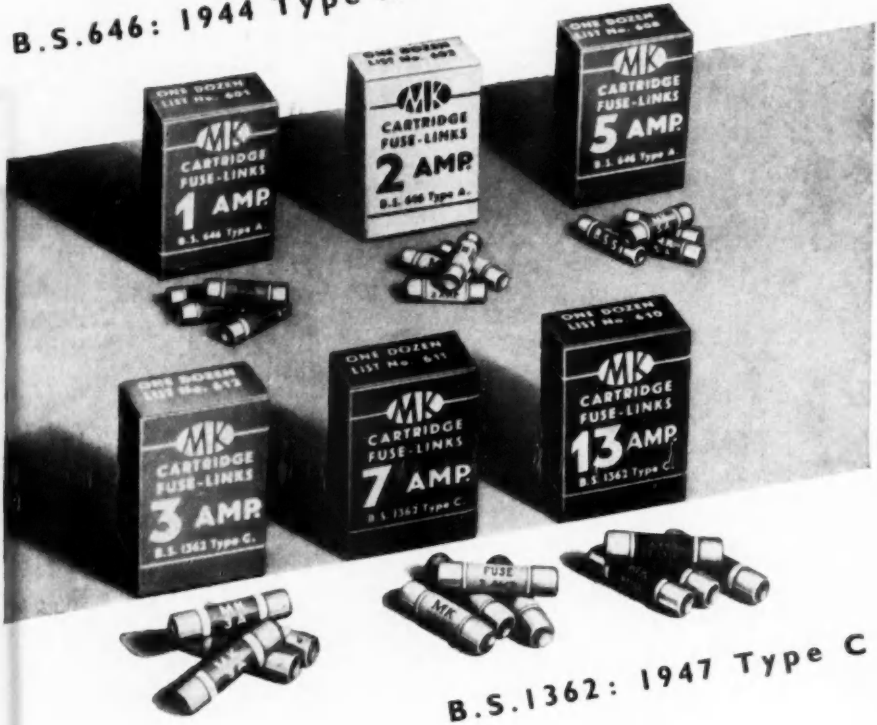
M.K. CARTRIDGE FUSE-LINKS

B.S.646: 1944 Type A



B.S.1362: 1947 Type C

B.S.646 : 1944 Type A. 250 volts — 1, 2 and 5 amp. current-ratings. For use in plugs, socket-outlet adaptors and the like.
B.S.1362 : 1947 Type C. 250 volts — 3, 7 and 13 amp. current-ratings. Primarily for use in plugs for domestic purposes.
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Dexion Angle is amazingly rigid and needs no bracing. You can use it over and over again for different purposes—it never deteriorates.

Try Dexion once and you will never be without a stock. It will prove its value to you many times over—you will think of dozens of uses for it from the moment you get it. Send for further details and opinions of well-known users.

A small stock of DEXION ANGLE makes a van load of equipment.

Send for illustrated folder D.1. Better still, see an actual installation of Dexion at 34, Fouberts Place, W.1 (near Liberty's)—*No appointment necessary.*

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Telephone: REGent 4841-5. *Grams:* DEXION, PICCY, LONDON.

Dexion Angle is protected by Brit. No. 620,696 and world patents.

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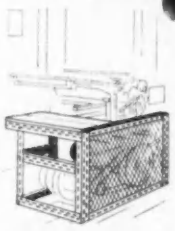
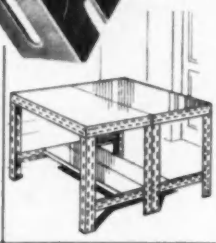
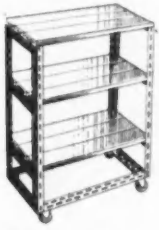
There are dozens of uses for DEXION ANGLE in your firm



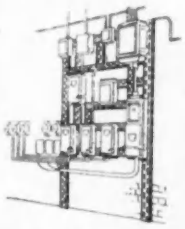
MACHINE GUARDS



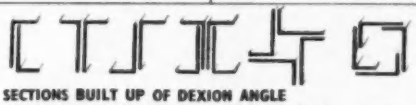
WORK BENCHES



TROLLEYS



SWITCHGEAR MOUNTS



SECTIONS BUILT UP OF DEXION ANGLE

Single angle is immensely strong but for even greater strength it may be bolted into sections as above.

T.A.2940

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BRITISH MARK
BRITISH STANDARD
Our guarantee of quality, strength and finish — vital essentials for a good job.

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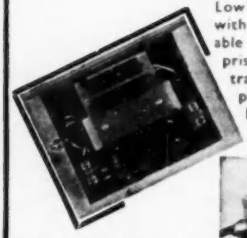
LOW VOLTAGE TRANSFORMERS



Low Voltage Lighting Unit with lid removed. Suitable for m/c tools, comprising double-wound transformer with fused primary and secondary D.P. on-off switch, housed in steel case.

Low Voltage Portable Transformer suitable for hand-lamps, portable m/c tools, etc. Fitted with Reyrolle plugs and sockets and carrying handle.

We specialise in the manufacture of LOW VOLTAGE TRANSFORMERS to customers' individual requirements. Single or three-phase from 50 V.A. to 25 k.V.A.

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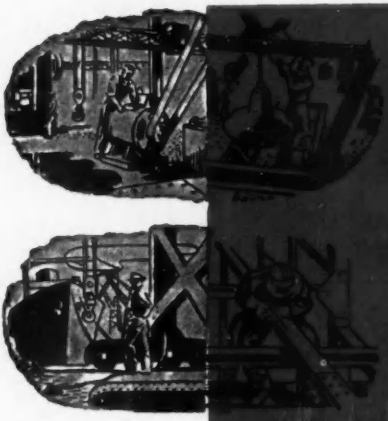
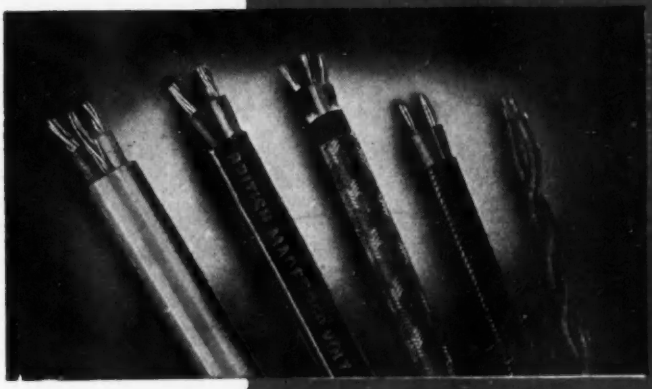
23 Lochburn Road, Maryhill, Glasgow N.W.
Tel: Maryhill 1893

In the drive for greater production . . .

ASHTON Cables are there



A call for electricity is also a call for ASHTON Cables. For machinery engaged on mass production, for factory lighting, for the motor which controls a heavy crane as well as for the clock on the office wall and the cooker in the canteen, ASHTON Cables are laboratory tested at every stage of manufacture, are thoroughly dependable even under the most exacting conditions



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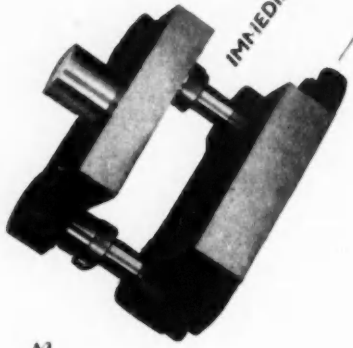

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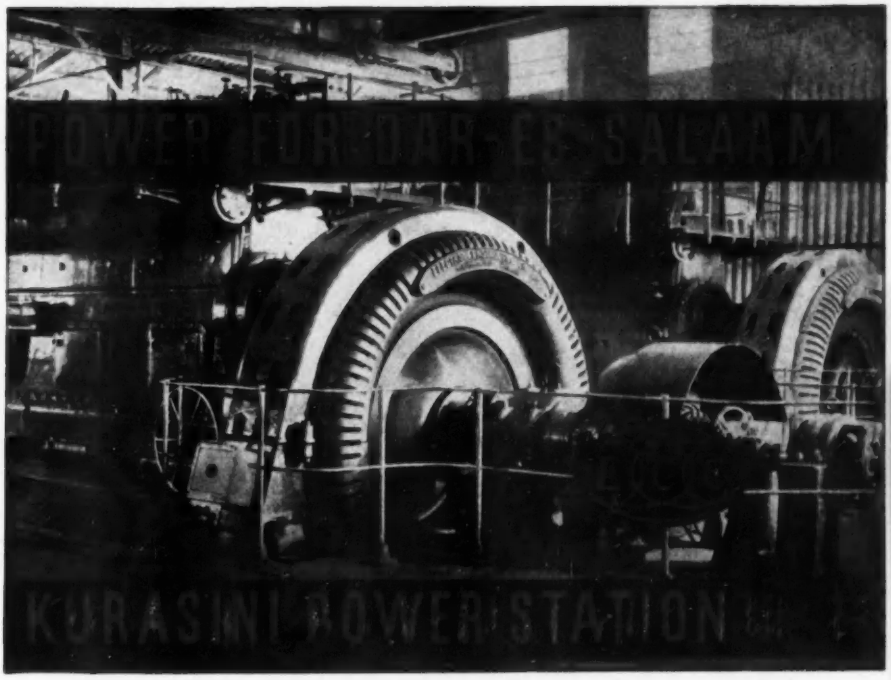

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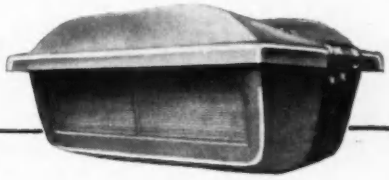

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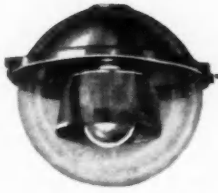

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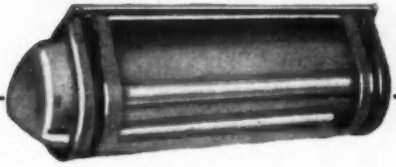

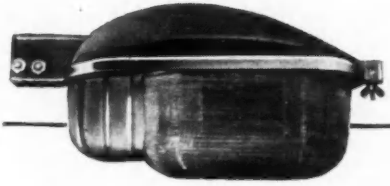

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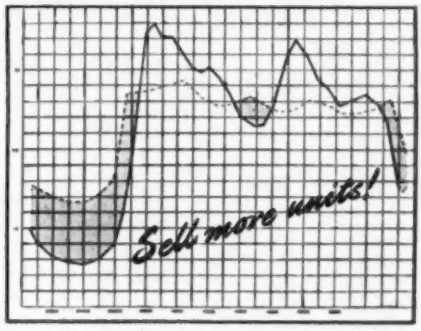

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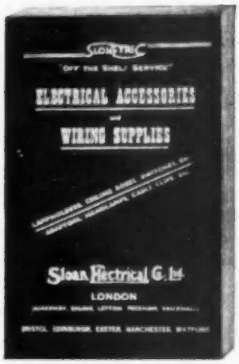

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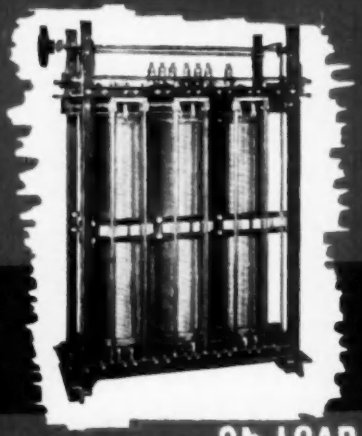

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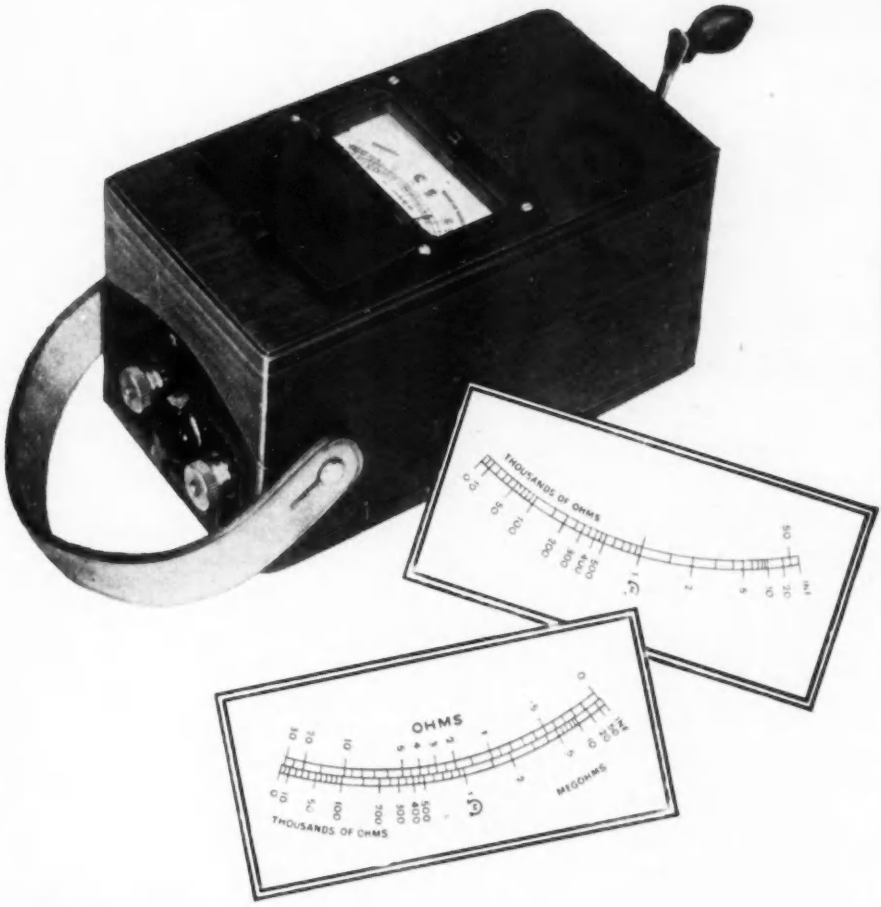

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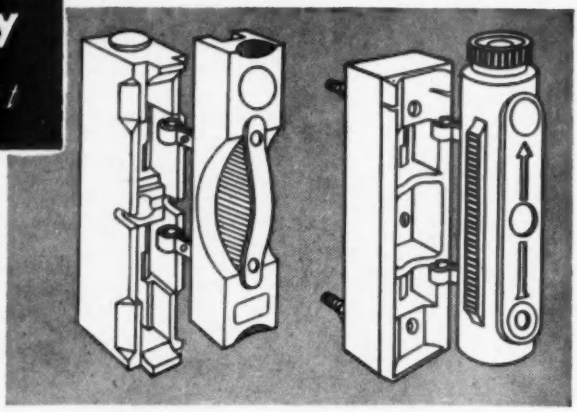

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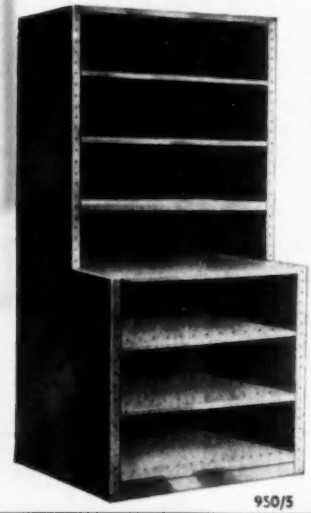

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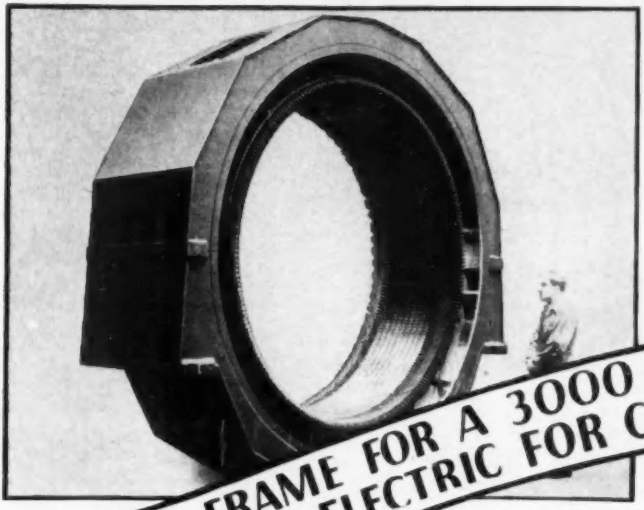

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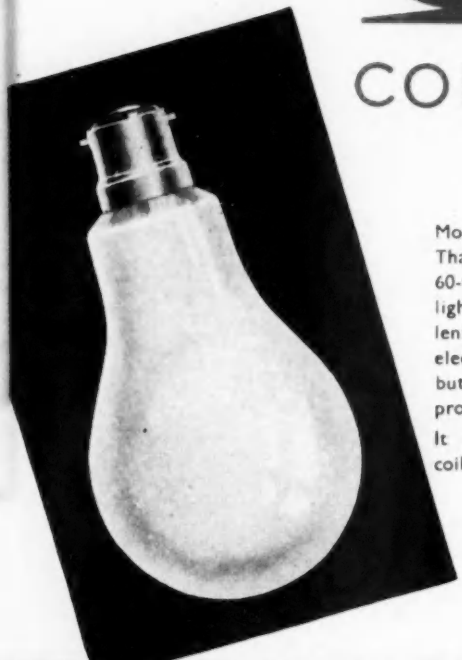

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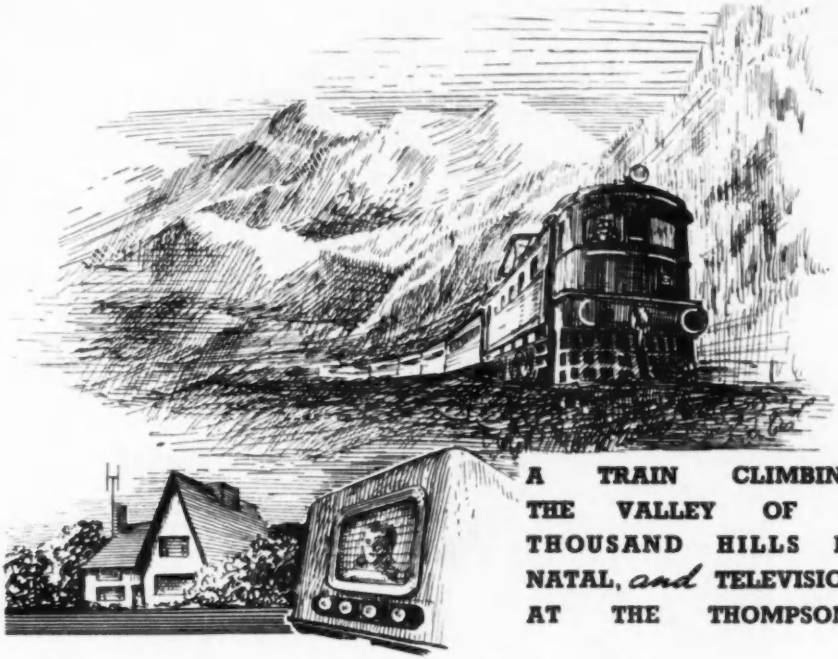

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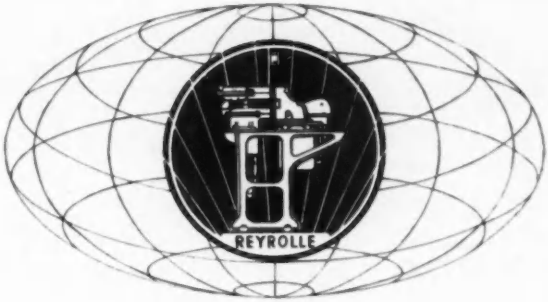

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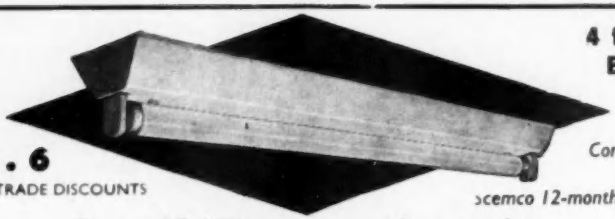

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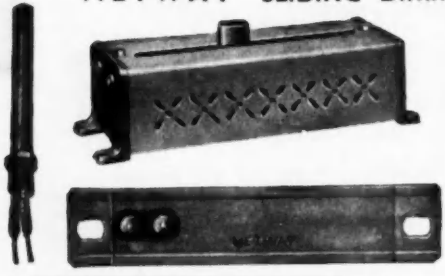

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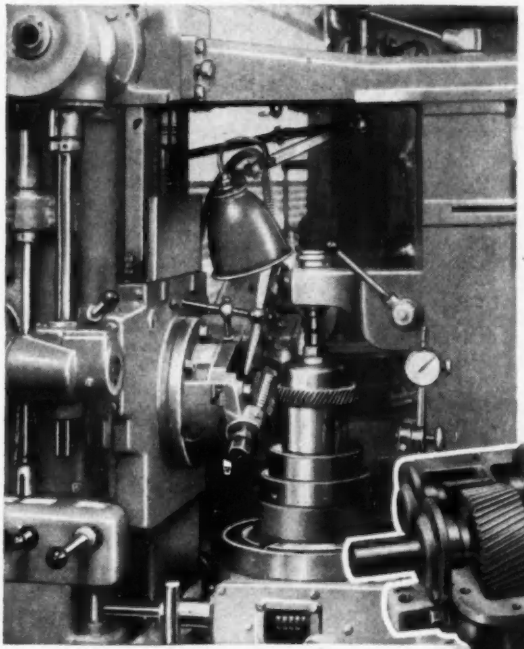

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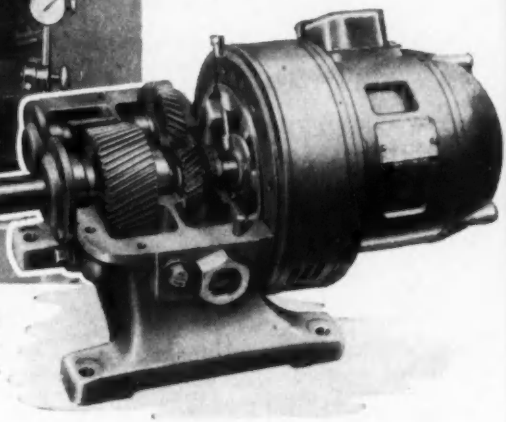

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Double Reduction	from 20... .....at... .. ....29.....		.....to 70.....at.....110	
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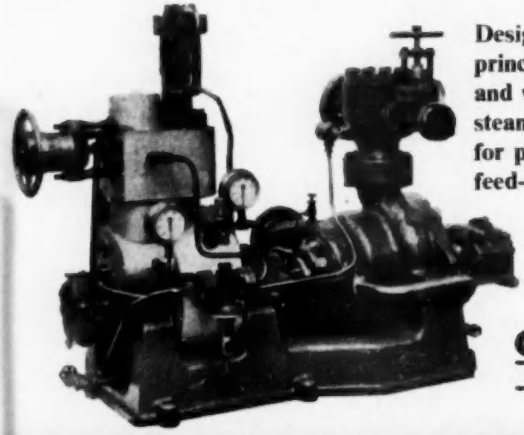

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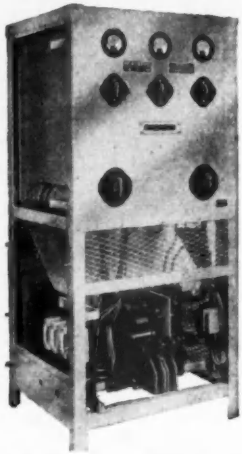

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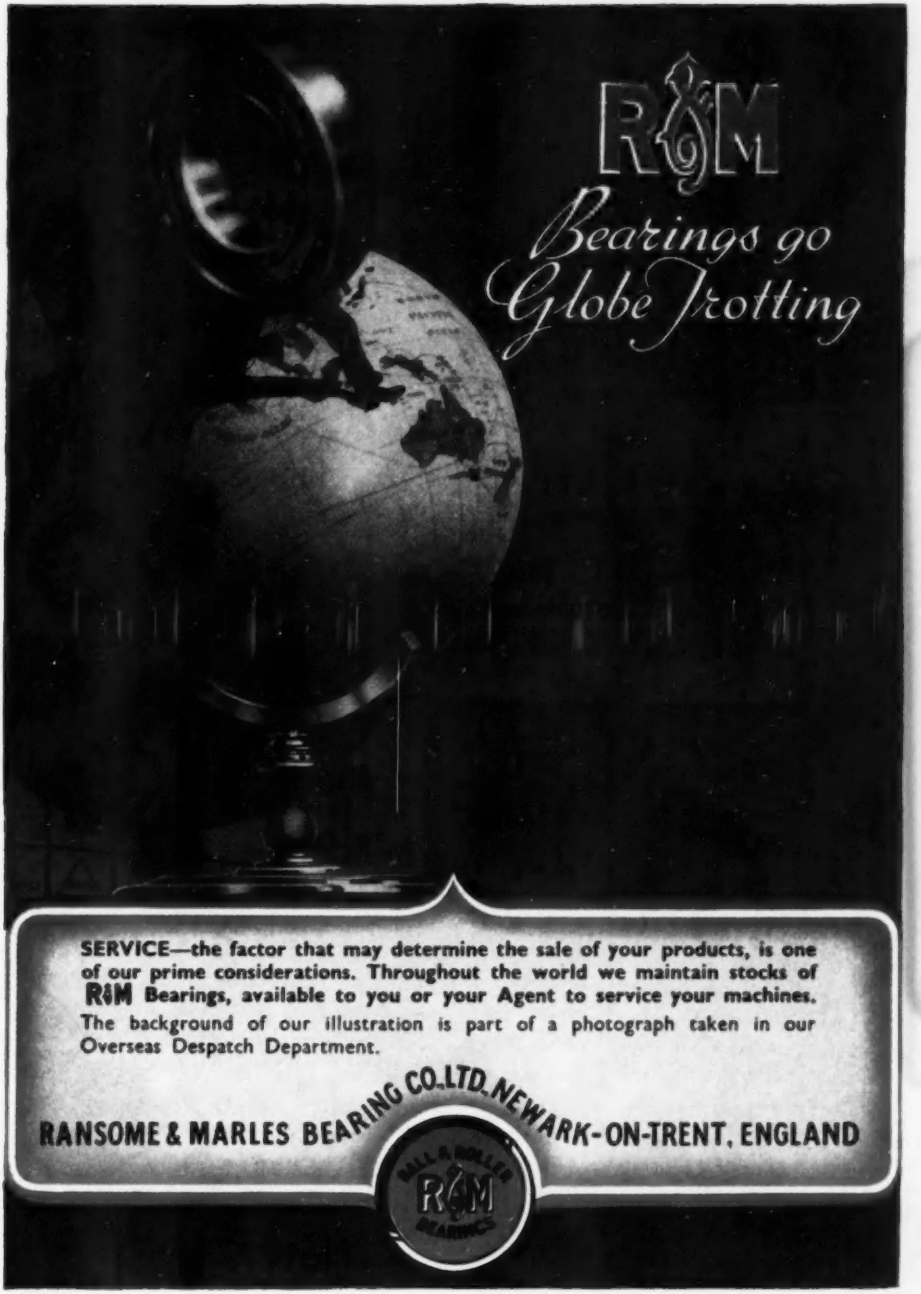
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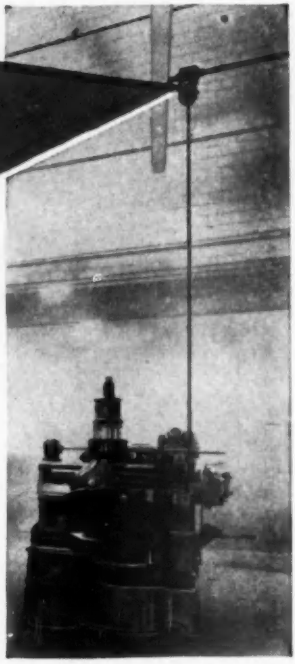

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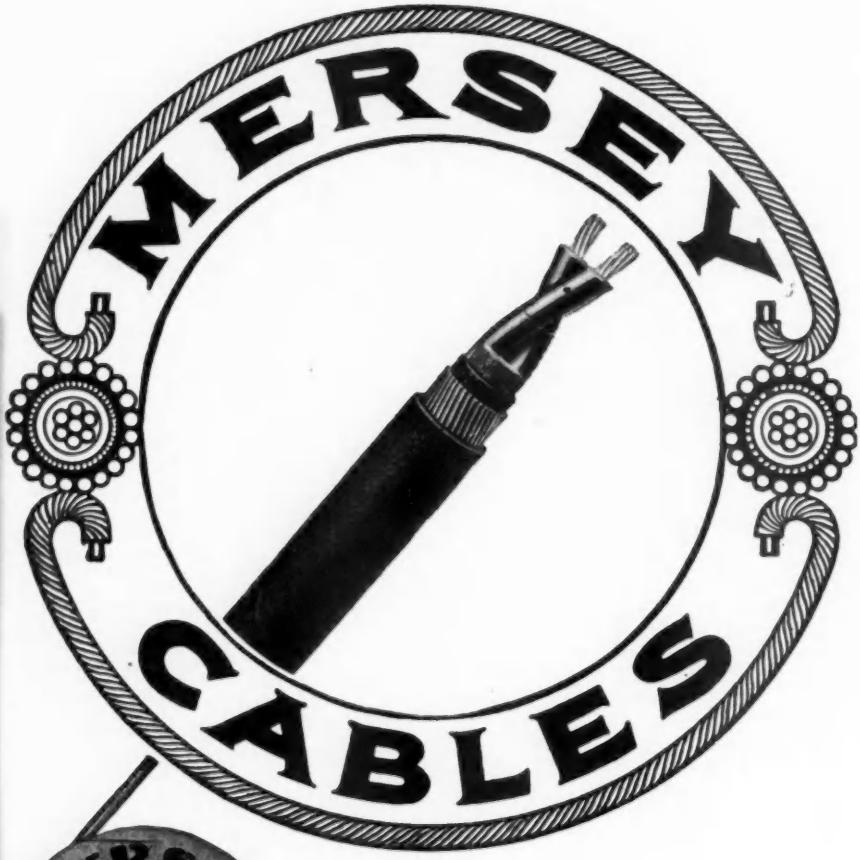

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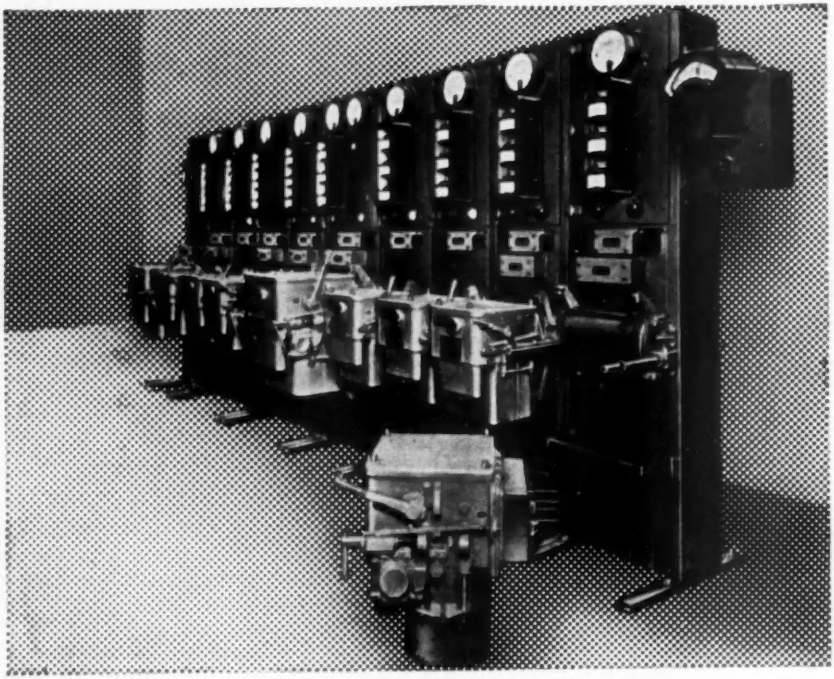

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ELECTRICAL TIMES

Vol. 118 No. 3074 THURSDAY, 5 OCTOBER, 1950

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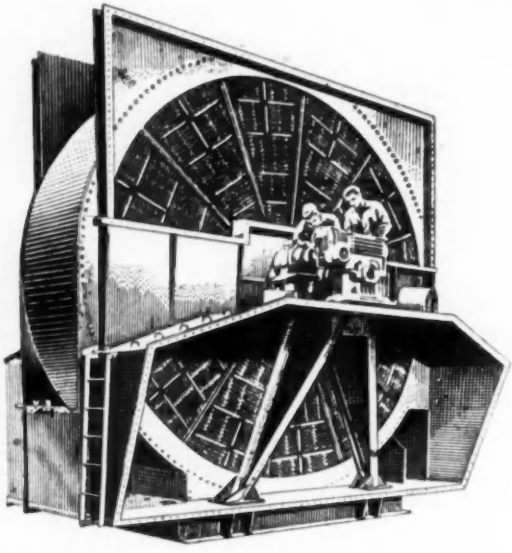

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Editorial

ELECTRICAL MAINTENANCE

IN spite of the wide application of electric power to all industrial operations, there are still many factories where the electrical maintenance engineer is the only responsible official with a direct interest in electrical matters. Men in such positions have little opportunity of obtaining information and working out new ideas by discussion with colleagues of similar interests. It has for long been the policy of THE ELECTRICAL TIMES to offset this disadvantage in its articles and news columns by providing a forum for the discussion of outstanding problems. This week we commence a new service in this field, with the first article of a series that is to present an account of electrical maintenance technique as practised in medium-sized factories. In this series we shall cover a wide range of industries, presenting all types of working conditions and plant accessibility, so that a critical comparison of methods will be possible. We have borne in mind, too, that good installation practice cuts down the amount of work that a regular maintenance scheme involves, just as the latter activity can reduce repair work to a very low total and all these phases are brought within the ambit of the articles.

SPOTLIGHT ON KITCHENS

THE culinary methods of the old-time chop-house, where the customer could watch his own meal being cooked, have unfortunately only survived in a few of the more exclusive —and correspondingly expensive—establishments. In a majority of restaurants and canteens the kitchens are regarded as something to be hidden away like dark and shameful secrets, or at best to be seen only as a momentary glimpse through swinging doors or narrow serving-hatches. Admittedly, for that matter, only a small proportion of restaurant kitchens could withstand close inspection. Elsewhere in this issue we describe a new canteen in which the architect has taken full advantage of the absence of fumes and dirt which electricity alone can offer, and so far from hiding his kitchen, has deliberately set out to make it an integral part of the canteen. This cannot fail to have a beneficial effect on the morale of the kitchen staff as well as on the confidence of their customers, and we feel that the principle is capable of extension to commercial restaurants. The popularising of the "show" kitchen, by raising the standard of kitchen cleanliness required by the public would cause a tremendous increase in the demand for the only means of cooking which will satisfy that standard.

BOOM IN BLACK LIGHT?

IT was perhaps to be expected that, although this country occupies a leading position in research on fluorescent materials, the latest commercial application of them should come to us from America. Few can have failed to see those bright new fluorescent poster printing inks which, although introduced only some three months ago, have now become relatively commonplace. It may reasonably be said, therefore, that the publicity world now accords to fluorescence a rightful place in advertising processes, but we suggest it will not be long before they become dissatisfied with the present limitations on the application of these inks, and seek ever brighter displays. Fortunately, the means are ready to hand, for the wonderful effects that can be achieved when fluorescent materials are illuminated by a black-light u.v. lamp have long been known in electrical circles. The time is ripe for a wider use of such lamps in publicity fields. The great development in screen printing since the war offers to advertisers a wide range of display designs in fluorescent inks, and when illumined with u.v. light the brilliance can be rivalled only by luminous tubes. We therefore

foresee a mild boom in black-light lamps if the present opportunity is seized by the electrical industry.

CONTROLLING CONTROL GEAR

THE Anglo-American Productivity Council's report on motor control gear, summarised elsewhere in this issue, is a document which will be read by the industry with mixed feelings. While it undoubtedly gives much interesting information and not a few hints on design and production, the Committee have undoubtedly set themselves a Herculean task—that of breaking a vicious circle. As is shown in the Report, British direct-on-line air-break contactors are comparatively expensive due to the limited demand which, again, is affected by the high price and the fact that direct-on switching is not always acceptable to supply authorities. Since demand is limited, each job, except for the smaller ratings, is practically tailor-made and there is little or no standardisation even of current ratings of contactors. Until the position regarding direct switching of squirrel-cage motors is clarified, however, the standardisation (and consequent cheapening) of the air-break starter for this duty will remain an unsolved problem. Few will deny the efficiency of the contactor on heavy making duty such as direct switching involves, but the technical superiority and even the price of a starter are matters of academic interest if it is proscribed by local regulations. The first move in the cheapening of control gear is up to the Area Boards.

NO SHUNTS FOR ALUMINIUM

VIEWS expressed in this column some months ago, on the superior convenience of transductors over shunts, receive support from the U.S. aluminium industry. The current issue of *Electrical Engineering* records that on the electrolytic cell circuits shunts, in addition to being massive, costly, and difficult to calibrate, required shunt leads of nearly 0·4 sq in. section to supply meters any distance away. Although a transductor for 75 kA d.c. requires over 16 kVA for a.c. excitation, the actual power component is only about 1 kW, or considerably less than the resistance losses of a comparable shunt. No mention is made, however, of our principal objection—the risk of failure of overload protection with any unforeseen interruption of the a.c. supply. This, after all, can be overcome. On currents of this magnitude it should be a fairly simple matter to arrange an emergency relay directly operated from the magnetic field around the main conductor.

THROUGH THE LOOKING-GLASS

"FIVEPENCE-FARTHING for one, twopence for two" was the price which Alice was charged for eggs in Looking-Glass Land, you will remember. This singular economic outlook was recalled the other day when, desiring to purchase a two-pin plug, we were asked 2s. 3d., while a three-pin plug of similar rating could be had for 1s. 6d. Representations that the three-pin plug contained over 50% more material than the two-pin were countered by the shopkeeper (we would hesitate to call him a contractor, and wild horses would not make us divulge his nationality) with a specious explanation concerning their respective qualities. This was a little difficult to accept, however, since the three-pin was made by a well-known firm, while the two-pin was of poor quality, with the distressing stamp of anonymity which used to be, in less enlightened times, the prerogative of the chain stores. Alice, you will remember, could only buy two eggs if she ate them both, and, by the same token, the B.S.I. have ensured that we must use all three pins—we cannot discard the earth pin and utilise the cheaper plug in a two-pin socket—unless it be one of the newer type moulded in rubber, which are physically as elastic as are the prices of their more rigid competitors. The lesson to be learned from this is, of course, twofold—(*a*) financial sanctions are being used to ensure compliance with the I.E.E. regulations; (*b*) technical journalists do, upon occasion, actually buy accessories.

Meteor

MAINTENANCE METHODS—No. 1

Food Factory Problems

Planned maintenance and a bonus system for repair work are factors in the efficiency of Huntley and Palmers' Reading biscuit plant

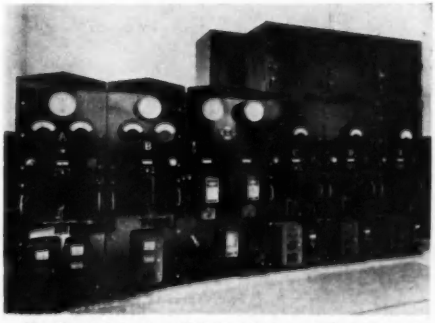
This is the first of a series of articles on electrical maintenance practice in selected firms, which is to appear in the Electrical Times at regular intervals. The Editor is always pleased to hear from maintenance engineers with ideas for further articles, comments on those that have already appeared, and queries on maintenance matters and installation practice in general

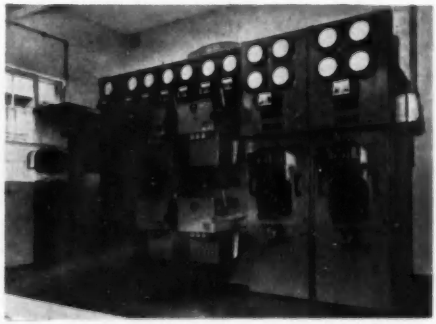
SUGAR must be kept out of bearings; lubricating oil out of biscuits. This statement briefly summarises the problem of operation and maintenance confronting Mr. H. M. Rabone, chief engineer of Huntley and Palmer Ltd., the cake and biscuit manufacturers of Reading, Berkshire. We were recently afforded an opportunity of visiting the twenty-four-acre factory of this famous firm, and of learning something of the methods adopted by its engineering department.

In spite of the size of the factory, which has grown in a rather haphazard manner in its 124 years of existence, power requirements are relatively small, and so far as electricity is concerned demand is further reduced by the proximity of the gas works, which makes this source of heating favoured for oven heating, the heaviest energy load in biscuit making. However, the maximum demand is between 900 and 1,000 kW even in the present days of restricted production, and this makes worth while the purchase of a bulk supply, which is taken at 3·7 kV.

Main Supply

A direct cable from Reading Riverside Generating Station provides the normal supply for the factory, with another line from a local substation as a standby. G.E.C. switchgear is used in the intake sub, and both Electricity Board and Huntley and Palmer metering panels are provided. An outgoing cable then supplies four distribution substations, which operate in parallel, the first of these being in the same building as the main sub. It is equipped with two 500 kVA 3,700/400 V transformers, and an outgoing switchboard built up from G.E.C. switchfuses and circuit-breakers. The second substation is situated in the office block at the front of the factory, and has two 250 kVA transformers. At present the third substation supplies two motor convertors which feed one section of the factory at 200 V d.c., operating on a two-wire unearthed system. In it is housed a 500 h.p. horizontal cross-compounded reciprocating steam engine which drives a 350 kW d.c. generator feeding the same system, but this engine set which was built in 1908 by Musgrave and Co. is only used for short period emergency service in the case of





On the left is the G.E.C. e.h.t. switchgear in the main substation, while the view to the right shows Brush l.t. gear in the new substation

breakdown of supply. For use at night and at the weekends, when the demand in this section of the factory is very light, there is a 100 kW Hewittic twin bulb mercury arc rectifier.

This d.c. rotary sub is becoming redundant with the gradual change-over to a.c. working in the area. A new a.c. transformer substation has been built and equipped with plant and switchgear supplied by the Brush Electrical Co. Ltd., to furnish a 400 V a.c. supply.

Steam Raising

Some years ago large scale electrical generation was considered for the factory, but demands for heating and process steam have since decreased, and the scheme is no longer considered to be economic. In anticipation of this change, however, a boiler house was built equipped with Babcock & Wilcox 30 klb/hr water tube boilers, generating steam at 250 lb/sq in., with superheating to 500° F. The steam is distributed by h.p. trunk mains and reduced to a working pressure of 60 lb/sq in. for use in the various departments. Make-up water for the boilers is obtained from the River Kennet, which flows alongside the factory.

The boilers are provided with chain grate stokers, and in their operation provide an interesting example of industrial integration. Coke breeze from the adjacent gas works is used for firing in conjunction with the Huntley and Palmers oil spray ignition system developed by the firm at the time of the fuel crisis to make them independent of direct coal supplies. This system of boiler firing, which has proved extremely economical, has already been described elsewhere in the technical press. Alternatively, a sandwich bed of coal and breeze, or of coal alone, can be burnt. In addition to normal applications of the steam, it is used to charge the fireless locomotives which work the internal haulage system.

Secondary Distribution

All wiring for secondary distribution is carried in heavy gauge solid drawn enamelled steel conduit, with a minimum diameter of ¾-inch. The use of this material is governed by the firm's own code of practice, which also embodies appropriate sections from the I.E.E. wiring rules, such as those dealing with earthing and earth connections. Power circuits are kept separate from those for lighting in individual departments, although up to that point a common four-core cable is used. This step is taken on account of panic danger with a large number of women employed; it is considered advisable to take every precaution against light failure. Emergency gas lighting is provided.

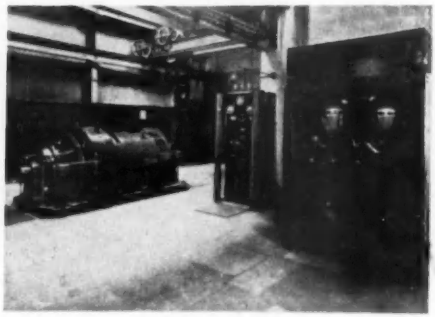
Distribution boxes are labelled a.c. or d.c., and are all numbered. Inside each box there is a table giving details of the sub-circuits fed, and care is taken to maintain the R, W, B phase identification colours right the way through the system.

Motor loads are on the whole light, mixers and mills requiring the heaviest drives. Most of the a.c. motors installed in the factory are, therefore, squirrel cage induction machines, speed variation where required being obtained by the use of variable speed mechanical gearing. A former limit of 1 h.p. for the direct starting of induction motors has now been relaxed to permit the use of this simple method for sizes up to 5 h.p.

Some synchronous induction machines are used, and the two largest units installed are both Crompton Parkinson auto-synchronous motors, which operate over-excited to help keep the factory power factor at an overall value of 0·9. They also have the advantage of providing the high starting torque required for a sugar mill (60 h.p. machine) and a dough mixer (100 h.p.).

Some small apparatus and portable equipment is operated at 50 V for safety reasons, local step-down transformers being used. Another safety measure is the use of all-rubber plugs (Walsall) for portable appliances. Very good service has been obtained from these in comparison with the usual plastic insulated types.

Electric motor maintenance is based on a patrol system, operated by semi-skilled workmen known as motor attendants. These men are qualified to attend to such matters as the cleaning of motors, renewal of brushes, the examination and adjustment of contacts in control gear, and the replacement of lamps. In addition patrols inspect motors and other



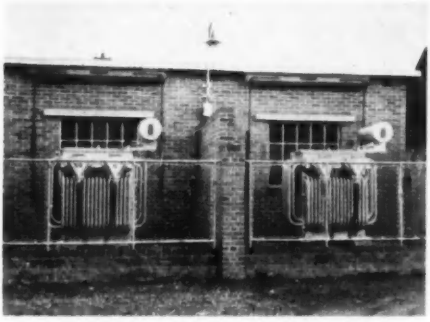
The rotary substation

gear for incipient trouble, and so are very often able to anticipate breakdowns.

Lamp replacement is based on a regular scheme of photometer surveys, care being taken that light intensities are measured at the appropriate height off the ground. Filament lamps are used in some parts of the factory, fluorescent lighting elsewhere.

Details of all motors, machines, etc., are kept indexed, and notes on faults and repairs are entered up.

Substations are visited twice a day, when log sheets giving power factor, load, the maximum demand reading and the energy meter reading are completed. In addition the earth leakage recorders installed in each substation are examined. These earth leakage recorders consist of a recording ammeter connected in the earth lead of the station, and thus show any earth faults occurring on the sections fed from the particular sub. From this information



Outdoor transformers for the new substation

earths not cleared by fuses may be looked for and rectified. To protect the recording ammeters a relay is included in the earth circuit which shorts out the ammeter if the earth leakage currents exceed 40 amp. At the same time a series resistance is inserted in the earth lead to prevent further rise of current.

A complete inspection of the power plant and electrical switchgear takes place twice a year, usually at Easter and the August Bank holiday. At these times all switchgear and fuses are overhauled and insulation tested.

Repair Schedules

The various inspection routines having shown faults in apparatus, it remains for them to be rectified. Major repairs and extensions and the order of priority are considered by a small committee composed of the chief engineer and two

Step-down transformers in the North substation

directors of the firm, but for the general everyday run of maintenance and repair work a planning and estimating office takes control.

Maintenance at Huntley & Palmers is built around a bonus scheme based on this estimating office, which is staffed by a team of practical experienced men who allocate a priority to each job, and estimate the time to be taken for completion. Appropriate particulars are entered on a job sheet which is passed via the foreman to the maintenance fitters and electricians selected to complete the job. Bonuses are then paid on a time basis.

The whole of the plant machinery and services are subject to routine maintenance and attention, definite work being scheduled to be carried out at fixed intervals. Job cards and instructions for routine maintenance are issued to personnel from the estimating and bonus office at the appropriate recurring time.

This scheme has been found to work well, and to be the best of several considered. Apart from speeding up the work it has the advantage of allowing priorities to be allotted and adhered to.

General Experience

On the whole few serious troubles have been met with on the Reading installation. Single-phasing occurrences are rare, and the regular patrol has usually detected that the motor was over hot before serious damage has been done.

Some dissatisfaction is felt with the tendency of manufacturers to "streamline" machines, partly because this practice makes control gear difficult to get at, and consequently delays fault diagnosis. An additional objection lies in the false sense of security often given by the smooth sheet metal covers. For food factory purposes stout cast covers are required, with machined facings, so that oil cannot get out into the food being processed.

Stourport "B" Opened

First Slag-tap Furnace in Britain Operating

THE formal opening of Stourport "B" station took place last week when the Lord Lieutenant of the County of Worcester, Admiral Sir William Tennant, K.C.B., C.B.E., M.V.O., unveiled a plaque commemorating the occasion.

This station, which was described in our issue of June 22, is of particular interest both in design and construction. Steam conditions are in the higher range, being 1,275 lb/sq in. and 975° F. The steam generating plant by the Stirling Boiler Co., is unusual in that it embodies continuous slag tapping.

The 60,000 kW E.E. turbo-alternator is a three cylinder tandem machine driving both house and main alternators, the former being air, and the latter hydrogen cooled. Separate excitation is provided by duplicate low speed motor generator sets housed in a special exciter room away from the turbine floor.

Several other points of layout are of interest, but have been dealt with in our article mentioned above. However, probably the most impressive thing to the electrical engineer is the great degree of instrumentation and centralisation of control which has been attained. Virtually the whole of the plant and auxiliaries can be operated from the central control board located on the turbine floor.

Speaking at a high tea, held after the unveiling of the plaque, Admiral Sir William Tennant, in proposing the "British Electricity Authority" referred to the rapid development of electricity in the Fleet, and gave some details of the use of radar when he was Second-in-Command of the Eastern Fleet in 1942-3. He congratulated those concerned with the erection of the station.

Mr. F. W. Lawton who replied, reaffirmed his faith in nationalisation, and pointed out that improvements in the technical side had enabled the price of electricity to be kept low despite increases in cost of coal and labour.

Other speakers included Mr. L. F. Jeffrey (the Guests) and replies were made by Mr. G. D. N. Naborre and Mr. J. T. Moore. Mr. H. P. Ewbank gave some reminiscences of Stourport.

N.P.L. ANNUAL REPORT

STEADY advances in several fields are included in the Annual Report of the National Physical Laboratory for 1949. (Price 1s. 9d. from H.M.S.O.). In the Electricity Division work has continued on equipment for the national service of standard radio transmissions, and a new determination of the velocity of light has been made. Of more interest to the general electrical industry is a new bridge method for evaluating capacitance in terms of resistance and frequency which is remarkably convenient in operation. A standard resistance has also been designed with a value of 1 ohm, a phase angle of less than 10^{-4} radians at 10 kc/s and a current-carrying capacity of 0·5 amperes.

The high-voltage laboratory is carrying out on behalf of the E.R.A. studies on corona discharges produced by surge voltages, and a new oscillographic equipment incorporating a sealed 10 kV tube and a radio-frequency power pack has been designed and built.

In the Engineering Division electric strain gauge technique has been improved and the Division continues to make special gauges for establishments outside. Recently a few dozen gauges measuring 3 by 2 mm overall were supplied to a hospital in connection with the measurement of loads imposed on teeth during mastication.

Metallurgical work on the creep of steels used in steam-operated power plant has continued. The investigations on 0·5% molybdenum steels will be concluded as soon as possible, although the programmes on the effects of cold drawing and surface defects are likely to continue for a long time due to the tedious nature of the experiments concerned. The properties of high melting point metals have been examined at a temperature of 1,000° C in order to assess their worth in the construction of gas turbine blading.

The Electronics Division has been actively engaged (in co-operation with T.R.E.) on industrial applications of electronics, and also (with the Mathematics Division) on the construction of the Automatic Computing Engine. Preliminary work is being done on a pilot model which, while similar to the final project in basic mechanism, has a limited memory of 8,000 binary digits. The completed A.C.E. is expected to have a memory of about 200,000.

TRANSFORMER REGULATION

Some Methods of Calculation

by H. E. GREEN, B.Sc.(Eng.), A.M.I.E.E.

THE inherent regulation of a transformer is defined as the difference between the secondary voltage at no-load and the secondary voltage at rated load, expressed as a percentage of the no-load voltage. It is usually calculated by the following formula which is given in BSS. 171, 1936 (Reference 1): % Regulation

$$=R\cos\varphi+X\sin\varphi+\frac{(X\cos\varphi-R\sin\varphi)^2}{200} \quad \ldots\ldots(1)$$

where:—

R = percentage resistance voltage drop

X = percentage reactance voltage drop

$\cos\varphi$ = power factor of the load.

This expression is, however, an approximation and the exact formula is given by the expression: % Regulation

$$=R\cos\varphi+X\sin\varphi+100-\sqrt{100^2-(X\cos\varphi-R\sin\varphi)^2} \quad \ldots\ldots(2)$$

Providing the magnetising current is small (which is usually the case for power transformers) this expression can be evaluated to any desired degree of accuracy, depending, of course, also upon the accuracy of the resistance, reactance and power factor from which it is derived. This formula is given (with different symbols) in the V.D.E. specification[2] for transformers.

The proof of the approximate formula is usually given in textbooks[3], but the exact expression appears to be generally overlooked and it may, therefore, be worth while giving the proof here.

Proof of Formula

Fig. 1 shows the vector diagram for a transformer, in which OB is the no-load voltage, and OA is the full load voltage given by the reactance drop BP and the resistance drop AP due to the current I at a power factor of $\cos\varphi$ lagging. By definition, the % regulation:

$$=\left[\frac{OB-OA}{OB}\right]\cdot 100=\left[\frac{AQ+QD}{OB}\right]\cdot 100 \quad \ldots\ldots(3)$$

Now $AQ=AP\cos\varphi+BP\sin\varphi$

and from the geometry of the circle (Fig. 2):—

$$FQ\cdot QD=BQ\cdot QC$$

$$\text{i.e. } (2\,OD-QD)\,QD=BQ^2$$

from which: $QD^2-2\,OD\cdot QD+BQ^2=0$

Solving this quadratic equation:—

$$QD=OD\pm\sqrt{OD^2-BQ^2} \quad \ldots\ldots(4)$$

Now $BQ=BP\cos\varphi-AP\sin\varphi$ which, substituted in equation (4) gives:—

$$QD=OD\pm\sqrt{OD^2-(BP\cos\varphi-AP\sin\varphi)^2}$$

Substituting the values of AQ and QD in the expression for regulation, equation (3), we get:

$$\%\text{ regulation}=\frac{100}{OB}\left[AP\cos\varphi+BP\sin\varphi+OD\pm\sqrt{OD^2-(BP\cos\varphi-AP\sin\varphi)^2}\right]$$

If the values of resistance and reactance are expressed as a percentage, then $AP=R\%$, $BP=X\%$ and $OB=100$, from which:

$$\%\text{ regulation}=R\cos\varphi+X\sin\varphi+100-\sqrt{100^2-(X\cos\varphi-R\sin\varphi)^2}$$

(The minus sign in front of the square root is,

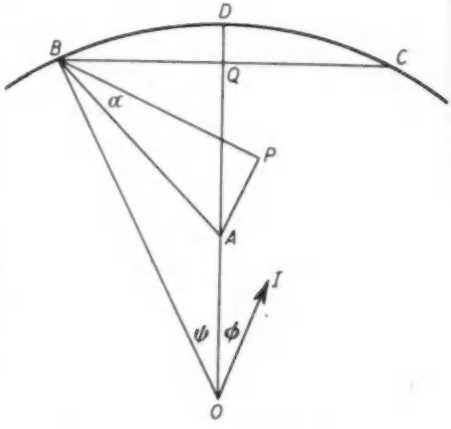


Fig. 1. Vector diagram of transformer

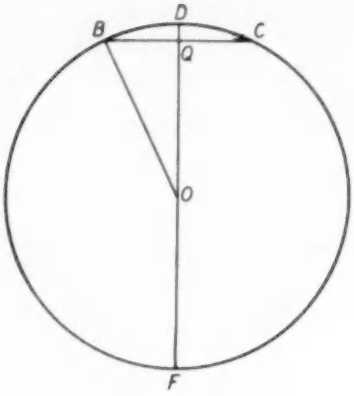


Fig. 2.

of course, the correct one in this expression.)

It is interesting to note that by expanding the expression under the square root sign by the binomial theorem, the % regulation can be put in the form:—

$$R\cos\varphi + X\sin\varphi + \frac{100}{2}\left(\frac{X\cos\varphi - R\sin\varphi}{100}\right)^2 + \frac{100}{8}\left(\frac{(X\cos\varphi - R\sin\varphi)}{100}\right)^4 + \frac{100}{16}\left(\frac{(X\cos\varphi - R\sin\varphi)}{100}\right)^6 + \text{etc.} \quad \ldots\ldots\ldots\ldots(5)$$

it becomes obvious why the approximation given in BSS. 171, 1936 (equation 1) is sufficiently accurate for most practical cases.

Previous to the introduction of formula (1) it was the practice to use the approximation:—

$$\%\ \text{regulation} = R\cos\varphi + X\sin\varphi \quad \ldots\ldots(6)$$

This is sufficiently close for impedances up to about 5%. It was used because in the early days of transformer practice low impedances were usual. The kVA rating of transformers was small, and they were of comparatively low voltage, thus having an inherently low impedance.

Under present-day conditions with higher system voltages and transformers of larger size, having an inherently higher impedance, this approximation is no longer applicable except in the case of small distribution transformers. In addition the voltage drop in a distribution network was formerly kept as low as possible, the size of the systems being small so that short-circuit currents were not of such great importance as they are today. With the large short-circuit capacities of present-day systems, high impedances are often specified in order to limit the short-circuit currents and also the mechanical stresses in the windings.

The table shows the voltage regulation for the range of transformers 1, 10 and 100 MVA, the figures for resistance and reactance being taken from the author's article on "Transformer Performance" in the ELECTRICAL TIMES, September 2, 1948[4].

Phase Displacement

In some cases it is also important to know the phase displacement between the primary and secondary voltages of a transformer, particularly in the case of one which is inter-connecting two different systems. This can easily be derived from Fig. 1 as follows:—

Phase displacement between primary and secondary voltages $= \psi$

$$\sin\psi = \frac{BQ}{OB} = \frac{BP\cos\varphi - AP\sin\varphi}{OB} = \frac{X\cos\varphi - R\sin\varphi}{100} \quad \ldots\ldots\ldots\ldots(7)$$

As an example we will take the 100-MVA transformer given in the table, in which $R = 0{\cdot}7\%$ and $X = 15{\cdot}0\%$. With full load at a power factor of 0·8 lagging:—

$$\sin\psi = \frac{15{\cdot}0\times 0{\cdot}8 - 0{\cdot}7\times 0{\cdot}6}{100} = 0{\cdot}1158 \text{ therefore } \psi = 6^\circ\ 39^1$$

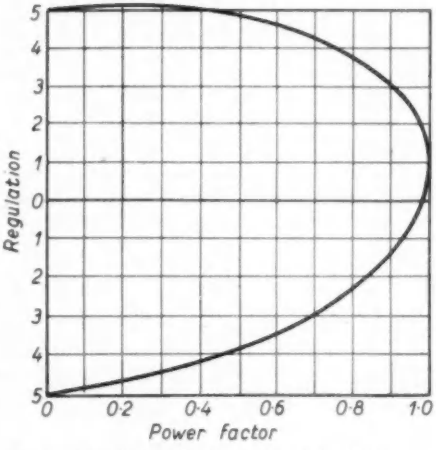


Fig. 3. Regulation for lagging and leading power factors R=1% X=5%.
(Plus regulation indicates voltage drop
Minus regulation indicates voltage rise)

Before concluding, the various graphical constructions for transformer regulation may be mentioned.

The equation: $e = R\cos\varphi + X\sin\varphi$ can, by squaring and rearrangement, be expressed in the form:—

$$e^2 - 2e\,R\cos\varphi + (R^2 + X^2)\cos^2\varphi - X^2 = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

which is the equation of an ellipse[5]. Fig. 3 shows this ellipse for the 1-MVA transformer given in the table in which R=1·0% and X=5·0% and for which the simplified expression $R\cos\varphi + X\sin\varphi$ may be taken as sufficiently accurate.

It is also interesting to note that these equations can be put in the form:—

$$(e - R\cos\varphi)^2 + (X\cos\varphi)^2 = X^2 \quad \ldots\ldots\ldots\ldots (9)$$

which is the equation of a circle of radius X if $e - R\cos\varphi$ is plotted against $X\cos\varphi$ as shown in Fig. 4. (This is really a graphical method of obtaining $X\sin\varphi$ from $X\cos\varphi$.)

The regulation can also be accurately expressed in the form:—

$$e = Z\left[\sin(\varphi + \alpha) + \frac{100}{Z} - \sqrt{\left(\frac{100}{Z}\right)^2 - \cos^2(\varphi + \times)}\right] \quad \ldots\ldots\ldots\ldots (10)$$

where:—

$Z = \%$ impedance voltage drop

$\sin\alpha = R/Z$

and a diagram has been developed expressing this formula graphically[6].

The use of nomograms in place of mathematical calculations is well known, and, as might be expected, they have been devised for the determination of transformer regulation. In this connection the reader is referred to three articles[7 8 9], in which nomograms for the regulation (and efficiency) are given.

Conclusion

In conclusion it should be noted that these formulae apply only to single, two, or three-phase transformers with two windings, with the same number of phases on the primary and secondary, and with balanced loads. Transformers with three or more windings, phase conversion transformers (3/2 phase and 3/1 phase) and transformers with unbalanced loads etc., must be treated as special cases according to their own special features.

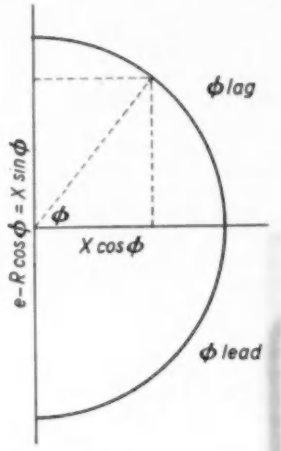


Fig. 4

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9 G. Cardellino: "Nomogrammi per la Determinazione dei Rendimeti e delle Cadute di Tensione nei Trasformatori." *L'Elettrotecnica*, Vol. 24 pp. 340-343, June 10, 1937.

VOLTAGE REGULATION CALCULATED BY DIFFERENT FORMULAE (cos φ = 0·8 lagging)

Transformer rating	1 MVA	10 MVA	100 MVA
Resistance voltage drop (R)	1·0 %	0·85%	0·7 %
Reactance voltage drop (X)	5·0 %	10·0 %	15·0 %
$R\cos\phi + X\sin\phi$	3·8 %	6·68%	9·56%
$R\cos\phi + X\sin\phi + \frac{(X\cos\phi - R\sin\phi)^2}{200}$	3·86%	6·96%	10·23%
$R\cos\phi + X\sin\phi + 100 - \sqrt{100^2 - (X\cos\phi - R\sin\phi)^2}$	3·86%	6·96%	10·23%

Wire Rope Parting

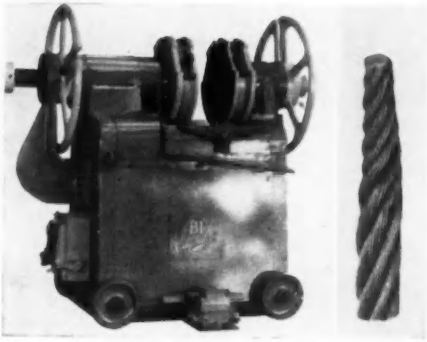
THE parting of wire ropes is greatly facilitated by means of a new machine developed by B. I. Callender's Cables Ltd. This machine is suitable for steel and hemp cored ropes, ranging from $\frac{3}{8}$ in. dia. to $\frac{7}{8}$ in. but can in emergency be used for ropes up to $1\frac{1}{8}$ in. dia. The wire rope is parted in such a manner that the ends are sealed and left in taper form.

In order to use the machine, the rope is marked off and then lowered into the contact grips. A heavy electrical current at low voltage is passed through the portion of the rope between the clamping heads which heats it to a malleable condition. The rope is initially twisted to bring all strands into close contact with each other and to ensure uniform heating throughout. Tension is then applied and the rope stretched until a pronounced waisted effect is obtained. When the rope is parted by burning, the molten metal welds the ends of the strands securely together forming an attractive seal which prevents unlaying.

Mechanical Details

The machine measures 2 ft 9 in. by 4 ft 8 in. by 4 ft 2 in. high, and is mounted on four wheels to enable it to be readily moved to any site where a mains supply is available. The clamping heads are of cast copper alloy with machined bearing surfaces and the chuck jaws of hard, high conductivity copper alloy. A gap distance between the heads of from $1\frac{1}{2}$ in. to $7\frac{1}{2}$ in. can be obtained.

Electrically the main item is a 25 kVA transformer tapped on the primary side to give eight secondary voltages. The length of time for which the current is switched on depends on the size of the rope being parted, and varies from about 45 seconds for a $\frac{3}{8}$-in. dia. rope to 2 minutes for a 1-in. dia. rope.



Left, parting machine and right, appearance of wire rope end after parting, showing taper

BRITISH STANDARDS

Friction Surface Rubber Transmission Belting. *B.S.*351:1950. *Price* 2s. A war emergency issue is replaced by this revision of a specification originally published in 1929. The type of construction and the fabric to be used are set out, width tolerances tabulated, and tests described for determining elongation, adhesion, and seam strength. Suggestions as to service conditions are included in an appendix.

Woven Cotton Webbings. *B.S.* 1664-68:1950. *Price* 2s. 6*d*. These British Standards have been prepared in collaboration with the Services, Government departments, national organisations, and other large users, and provide quality standards for a wide variety of applications.

The specifications cover manufacture and finish, and give constructional details for each quality of webbing. The loom-state particulars include the width, minimum number of ends, picks per inch, weight per gross yards, and minimum breaking load values. Guidance for manufacturers is given on the counts of yarn. Tolerances are specified for width and weight. Appendices provide methods for conditioning test specimens, and for the determination of width, length, weight, picks per inch, number of ends in width and minimum breaking load values. Pattern numbers are provided for the use of Government departments as a means of identification and to assist in storekeeping.

Glossary of Terms used in Radar. *Supplement No. 4 to B.S. 204: 1943. Price 2s.*—Radar is one of the special applications of the use of radio waves which has been developed since the publication of the 1943 edition of B.S. 204, Glossary of terms used in telecommunication, so that it has become necessary to issue a supplement to this Glossary in order to standardise the terminology which has grown up in connection with this important field.

British Standards noted above can be obtained, post free, at the prices stated above from the British Standards Institution, Sales Department, 24 Victoria Street, London S.W.1.

Motor Control Gear

Comparisons between U.S. and British Methods and Prices

THE latest Productivity Team Report, "Electric Motors and Control Gear," was issued on Tuesday of this week by the Anglo-American Council on Productivity.

The constitution of the team has already been recorded in these pages, and their six-weeks' tour, during which time they visited ten establishments, large and small, in the U.S.A., has produced a document which will be read with close attention, not only by those actively engaged in the design and manufacture of control gear, but by the much larger body of persons interested in the application of electric motors in industry.

Comparison of Products

One fundamental advantage enjoyed by American manufacturers is the greater scope for direct-on-line switching of squirrel-cage motors which in Britain is still subject in many areas to widely varying restrictions. This, naturally, gives much greater scope for standardisation and mass production, whereas British manufacturers, with a smaller market, have to produce a much greater variety of equipment. In the U.S., the contactor starter is by far the most common type, manual starters being little used, while star-delta starting and slip ring motors are seldom met with, although a few examples of auto-transformer starting were seen.

Ironclad switches and fuses are represented in the U.S. by enclosed switches with knife blades and q.m.b. mechanism, usually in light gauge steel cases, except for watertight or flameproof gear. Cartridge type fuses are used, and incoming contacts are not shrouded. The miniature circuit-breaker is tending to displace switches and fuses on distribution boards, and there is a trend towards air breakers in lieu of oil, in the larger sizes up to 15 kV. Electronic control gear has also been highly developed.

To give some idea of the scale on which production is carried out, the report gives production figures typical of a number of factories visited. 2,000 magnetic starters; 7,500 pressure switches; 17,500 safety switches (equivalent of switch fuse); 37,000 miniature c.b.s.; 75,000 ft. of busbar ducting and 4,800 push-button operated manual starters are quoted as weekly averages. These do not necessarily represent steady production rates, but are indicative of manufacturing capacity available and are typical of the rates actually produced for a considerable part of the year.

Production Methods

In sections 3 and 4, the report devotes some twenty pages to a survey of design and manufacturing methods. These extend to comparatively small details as, for example, the purchase of small springs from outside suppliers packed in corrugated cardboard to save assembly delays caused by the operator stopping to disentangle them; the use of self-tapping screws in mouldings in place of metal inserts; and the purchase of screws which have a lock-washer fitted before thread-rolling.

Contacts, it is noted, are usually in the form of silver buttons for the smaller sizes, although there are several different methods of fixing the button to the base metal carrier. For larger sizes up to 150 amp. duo-metal is used, with a silver facing rolled on to a base carrier. Magnet laminations are usually automatically stacked as they leave the die. Normally cores are assembled by riveting in a hydraulic press, although welded assemblies were seen, this being in an experimental stage. Pole face finishing varied between different manufacturers; grinding, milling, surface broaching, and no treatment at all, were noted.

On conveyor belt final assembly, it was rare to see an ordinary screwdriver, power-tools—frequently self-feeding—being used. Tests applied on the assembly line showed much ingenuity and examples are quoted, one being the automatic testing of overload trips. Chute-fed into the testing fixture and pneumatically held, the breaker has current automatically applied to the thermal element and the operation timed. If it does not trip within the specific time, the element is cooled by an air blast, the calibration screw automatically adjusted, and a second test made, this being repeated a third time if necessary after which, if the operation is still unsatisfactory, the breaker is rejected by a different route.

Mass-produced starters utilise either bimetallic strip or solder pot thermal trips which are normally tested independently of their heaters and there is usually no adjustment of tripping value other than by changing the heater. Two overload trips were standard on a 3-phase

starter and most units had instantaneous magnetic releases in addition to thermal.

On custom-built control gear, engineering time is saved by standardisation as far as possible of the aggregation of units forming the most commonly required control groups, and on detail parts, such as relays, base sizes, door sizes, panel height (either constant or varying in fixed steps), and multiple holing of frameworks. Special gear, which does not lend itself to standardisation is dealt with by other methods. One ingenious device consisted of a large layout board on which were mounted Alnico magnets on 1½ in. centres. Paper drawings of components mounted on thin steel plate showing fixing holes in blue, and all internal connections and terminals in black, are moved around on the board to determine the best layout and then photographed, an enlarged print being used as a drilling template. A second photograph taken through a blue filter to eliminate the fixing holes, is used as the basis for a wiring diagram.

Erection of custom-built gear is facilitated by building as far as possible into self-contained sub-assemblies. Wiring diagrams are usually considerably simplified as compared with normal British practice, being reduced more to a "route chart" or key, rather than showing individual wires.

Fabrication of steel cases is dealt with in some detail, a number of press tool layouts being illustrated. The extended use of multi-stage follow-on tools is noted for general press-work, and the absence of fly-presses even for comparatively small operations. A point on which several comments are made, is the lack of guards on presses, milling and drilling machines. Many special purpose machines were seen, including automatic cutting off, drilling and countersinking of contacts from extruded sections, and the automatic soldering of solder-pot relays.

Testing

Although methods similar to those obtaining in Britain were used for special and semi-special apparatus, standard mass-produced items were normally tested only for magnet operation and overload tripping tests. High-voltage tests were considered a matter of type-testing only, and not applied to individual articles.

A large number of individual design details are noted in this section, including various methods of insulating square shafts, the use of spherical bearings for easy alignment, and a mass-production design for busbar channels suitable for portable tools.

Comparative Costs

Before comparing the cost of control gear, the report provides a background by giving comparative costs for commonplace necessities not only in currency but in man-hours, showing that although British prices are, in general, below American, they are far dearer in man hours, the only exceptions being bread (the same) and haircuts and newspapers being actually cheaper. On the same basis, costs for control gear are compared, one chart showing typical prices for direct-on magnetic starters, from zero-50 h.p., both in dollars and hours-purchase. This shows that although British prices for ratings below 10 h.p. are comparable (and, in the smaller sizes, actually lower), they rise rapidly until at 50 h.p. they are about double the U.S. prices, which appear to have only about three levels for the range. A further series of curves for U.S. magnetic starters compared with British direct-on magnetic starters up to 7½ h.p., manual direct-on from 7½ to 20 h.p., star-delta manual air break starters from 20 to 25 h.p. and manual direct-on oil break starters from 25 to 50 h.p. show discrepancies not nearly so large, the British price being only some 25 per cent. dearer for the largest sizes while other prices are comparable or even lower. Tables giving labour times for a range of starters show that in some cases British times are comparable with U.S. and the report admits that there is at least one firm in Britain using production methods which are as thorough as any in the U.S.

Personnel

Recruitment of labour, selection and training, welfare, and working conditions, are dealt with in another section of the report, as is the ratio of salaried employees to the total pay roll. Business and office methods, stock control, issue of works instructions and office mechanisation are also dealt with.

Conclusions

Chief recommendations include the simplification and standardisation of types, paying particular attention to the extended use of direct-on starters, and the specialisation by manufacturers in one portion only of the range required. Other recommendations (which nowadays are almost taken for granted in any report concerning the U.S.) include power-operated tools, greater mechanisation and the provision of mechanical handling. The report is available from the Anglo-American Council on Productivity at 21 Tothill Street, London, S.W.1, price 2/-.

Problems and Practice

IN ENGINEERING

Dry Rot and Electric Shock

A SHOCK had been obtained from the casing of a cylindrical pattern vacuum cleaner when an attempt had been made to operate the switch mounted on it. The 3-core flex of this cleaner had been fitted with an adaptor to enable the machine to be worked from the electric light socket, and the reason for the casing being alive was that the earth lead was making contact with the live terminal inside this adaptor. This trouble was soon located and rectified.

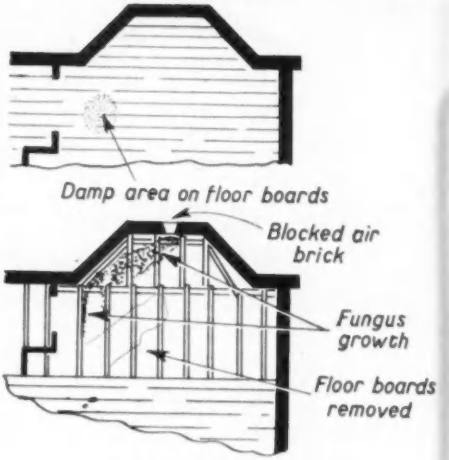
How the person using the appliance had completed a circuit to earth was at first rather perplexing. The machine had been placed on a table for the convenient cleaning of upholstery and was on a wooden floor, and was to all intents and purposes being used in a position that would normally be considered earth-free.

Careful examination of the floor in the position where the person using the appliance could have been standing revealed an area of lino about 2 ft diameter which felt slightly damp. On lifting the lino the floor boards beneath it were found to be damp.

Arrangements were made and the flooring was lifted. The circuit by which earthing had been obtained was then clearly revealed. Along two of the joists was a wet snow-like growth extending from a blocked air-brick in the adjacent bay window.

The sketches show a part of the floor, before the boarding was lifted and the affected floor joists with boards removed. The fact that floor boards nearer to the seat of the attack showed no sign of dampness may have been due to the fact that at some time the boards had been stained; the stain possibly possessing certain fungicidal properties.

This growth was later identified as one of a group of wood-destroying fungi which are collectively known as dry-rot. The interesting thing about these fungi from the electrical point of view is the root system they are capable of establishing. This root system serves a double purpose—to grow out in search of moisture and to grow out in search of further timber to attack. Although for its initial development it requires certain conditions of temperature and humidity, once established the root system of certain of these fungi will carry moisture to dry timber in order to create the conditions necessary for it to attack it. The root system will grow through bricks and mortar, so that it is possible for dampness



Details of dry rot growth

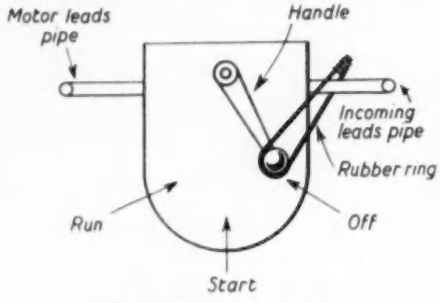
to appear at points far remote from the original seat of the attack. The root system is, of course, an effective electrical conductor, which by its nature is likely to be earthed either directly or indirectly at some point or other.

Outbreaks of this nature are fortunately rare, but when they do arise require prompt and drastic action by the building department. In the case in question the owner of the house was lucky that the electrical defect caused discovery of the trouble before it had become extensively established. In such cases the trouble is often not suspected by the occupant until the floor collapses.—*A. R. G.*

Starter Return Spring

THE return spring of an auto-transformer type starter controlling the 28 h.p., s.c. motor of a large pneumatic hammer fractured. As this hammer was practically in constant use during the three-shift working of a large locomotive machine shop it was imperative for the starter to be put in working order

with the least delay. No spare spring being available, a vacuum brake cylinder rubber rolling ring was procured, looped round the starter handle and temporarily secured to the g.i. pipe of the incoming leads. After a few trials to



Emergency return spring

ascertain the correct tension required, the rubber was cut to size and secured. The motor was then put back into service to the delight of the blacksmith who was able to get on with his work. This "spring" gave good service while the correct type was being manufactured.—*W. H. Gatehouse.*

Damp Asbestos

RECENTLY while installing a new dyeing machine at our works, I had current to two direct-on-line starters, although the fuse bridges were without fuse wire. Withdrawing the two offending fuse bridges and their asbestos packings, the trouble immediately disappeared. After checking cables, fuse carriers, etc., I tested the asbestos pads, and was amazed when I got almost a zero resistance. After drying these out thoroughly the trouble was completely cleared.—*A. Moss.*

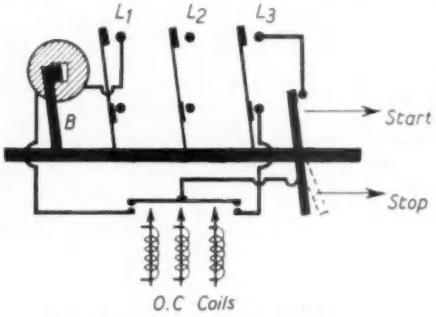
Non-Stop Starter

I CAME across a starter fault recently which, although simple enough to account for, was of rather a dangerous nature. The starter itself was of 3-phase, direct-on-line, push button pattern. The fault was an extreme difficulty in stopping the motor, due to the reluctance of the starter in breaking the circuit.

At times it had been necessary to open the main switch to stop the motor.

Testing the starter personally, I found that the stop button had to be pushed in with considerable force before the coil released the hold-on arm B. Opening the starter cover I found that the design was somewhat different from the usual arrangement, in that there were no stop button contacts included in the hold-on coil circuit. Instead, an arm was fixed on to the contact bar, and when the start button was depressed it pushed the top of the bar forward to make contact with Line 3. This completed the circuit for the coil, through the overload contacts, coil and back to Line 1. When the stop button was depressed this normally caused the lower part of the arm to move the contact bar outwards and break the coil circuit at L1 and L3, thus opening the starter circuit to the motor.

Due to repeated usage, however, the arm had been distorted away from the stop button (as shown dotted), so that there was only about one-eighth inch of travel left when the button met the arm. The effect of the spring loaded contact arms was such that the distance moved by the arm was only sufficient to lift back the hold-on arm B without breaking the coil circuit. Consequently, the arm was repeatedly attracted by the coil, and the motor kept on running. A dangerous situation which should never have been made possible. The simplest expedient to correct the fault was to re-align



Switch mechanism, showing distortion

the arm to its normal position. But this did not guarantee permanent reliability, however, so the customer was advised to have the starter altered to include a breaking contact stop push in the coil circuit. It appears that, although this type of starter could be used for stable drives, such as an enclosed fan, it is not to be recommended for machine-tool operation on account of its tendency to stick after repeated use.—*J. T. R.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

ELECTRICITY SUPPLY IN SPAIN

By F. DUTTON

IN England we are agreed that the standard of living is reflected in the consumption of electricity per head of population because electricity plays such a vital part in the social and economic life. While the consumption of electricity in Spain has not yet reached the level of our country, it is true to say that with the birth of the New State in Spain foundations have been laid on which the whole of her national life is being reconstructed.

For the purpose of electricity supply, the 51 provinces of Spain are grouped into 10 Zones; thus Zone 1 consists of La Coruna, Lugo, Pontevedra, part of Orense; Zone 2, Oviedo, Santander, part of Palencia, and Burgos; and so on. The number of generating stations in each Zone varies from 36 to 222, making a total of 1,228, of which nearly 82% are hydro-electric stations. The last complete Report dated 1948 gives figures as shown in Table 1:

TABLE 1: Generation

	Hydro.	Thermal.	Total.
No. of Stations	1,005	223	1,228
Capacity kVA	1,914,040	575,028	2,489,068
Production kWh	5,171,719,226	938,975,090	6,110,694,316

Consumption

The total production is distributed as shown in Table 2:

TABLE 2: Analysis of Consumption

Nature of Load.	% of total
Public Lighting	1·43
Domestic, Offices, Shops	13·29
Heavy Industries (Chemicals, Iron & Steel)	6·99
Agriculture	2·02
Traction	6·51
Other Industrial Uses	44·27
Used in Stations	2·86
Losses in Transmission and unaccounted for	23·98

Fig. 1 shows in graphical form the annual consumption of electricity for various classes of consumers from 1929-48 so that we are able to make a comparison between the development before the Civil War and since. It will be agreed that the consumption increases at a higher rate after 1939 except for 1945 when restrictions were imposed on account of the severe drought. It is interesting to note that during the years of the Civil War there was naturally a fall in the industrial consumption but no corresponding decrease in consumption for domestic and public lighting. This, of course, was a similar condition in our economic crisis of the 1930's.

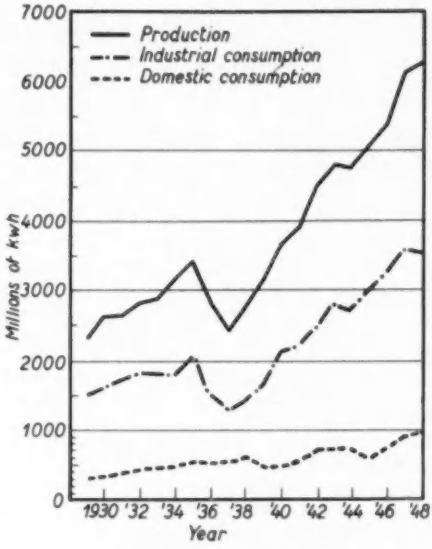


Fig 1. Electricity consumption

There is a very large potential demand in Spain without taking into account the rate at which new houses, clinics, social centres and new industries are being built. By the end of this year new generating plant will be in operation capable of meeting a demand of 280,000 kWs.

Quality of Apparatus

In 1941 La Asociacion Electrotecnica Espanol established a proving house for electrical apparatus manufactured in Spain, with a view to improving the standard of design and construction and for the benefit of consumers. After an appliance has been tested and approved the manufacturer is authorised to display the Association's "Mark of Quality". From the time that the Mark was established until January this year 247 appliances of all kinds had been tested, 111 rejected, and 136 approved. On the whole Spain, like other places on the Continent, has not reached the high standard of our English manufacturers. And, moreover, the consumers' installations are not up to the standard of work done by our electrical contractors.

Cranes in Steelworks

CONDITIONS under which steelworks electric overhead travelling cranes have to operate are so onerous that a fairly well-defined heavy duty machine has been evolved for use in such circumstances. It is considered by the British Iron and Steel Research Association that this development has now reached a stage where some measure of standardisation is desirable, and to further this end a "Specification for Heavy Duty Travelling Cranes for Use in Iron and Steel Works" has been drawn up by a sub-committee of the Association, and published at 15s.

Divided into 213 clauses under 37 headings, the specification is a comprehensive document likely to be of interest outside the particular field for which it was prepared. An instance here are the clauses covering crane performance, which take into account both the initial acceleration and the speed of various crane motions when it is not possible to specify an exact duty cycle.

An unusually full appendix gives details of the information which should be supplied with inquiries to manufacturers, and equally sets out the matter to be included in tenders. Further appendices list relevant standards and safety regulations. It is hoped that a British Standard Specification based on this document will be issued in a year or two.

STRESS RELIEVING

Application of Induction Heating

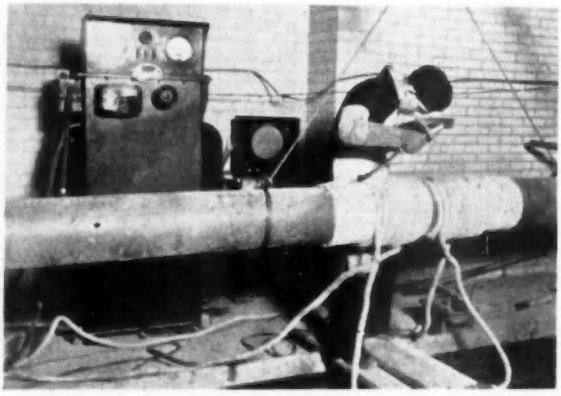
THE extensive use of welded pipes for oil refineries and power stations has caused particular attention to be placed on the problem of stress relieving of joints made both in the factory and on the site. In order to relieve the stresses it is necessary to heat the pipe to a temperature of 600°-650° C. followed by slow and even cooling. Pre-heating to a maximum of 400° C. before beginning welding operations is also required for pressure vessel work and steam pipe welding.

In order to enable maximum efficiency to be obtained both from a labour and from a materials viewpoint, an induction heating equipment has been designed by the Quasi-Arc Co., Ltd., in co-operation with Aiton and Co. It consists of a specially designed oil-cooled transformer giving a stepless regulation of current up to 600 amps at voltages varying between one and 100 at 50 c/s. The output is passed through asbestos-covered cables which when wrapped round the work to be heated induce eddy currents in the metal, thus raising the temperature.

A motor-driven auto-wound voltage regulator connected in the primary circuit controls the secondary voltage and current, and accuracy of regulation is such that the temperature of the work may be controlled to within 1° C.

Typical heating figures show that over a band 6 in. wide a temperature of 550° C. is reached in one hour on a pipe 6 ft long by 16 in. o.d. and 14 in. i.d. using 26 turns of 0·25 sq in. copper cable carrying a current from 345 amps at 64 volts to 425 amps at 93 volts.

When pre-heating is required, the same Quasi-Arc Induction Heating equipment is used, the coils being wrapped on each side of the joint before welding. It is, however, important to note that the heater coils should be switched off during the actual welding as stray magnetic fields may affect the welding arc.



Operator carrying out welding on a 10 in. bore chrome-molybdenum pipe. The transformer can be seen in the background

Notes on Wiring
by MEGOHM

T.R.S. Wiring

Some troubles with old installations

I HAD an interesting letter the other day from a reader engaged in electrical contracting, who is having trouble with an old installation. The wiring was carried out some 25 years ago with t.r.s. cable, in a large house over 300 years old, and containing oak beams, panelling, etc., which does not improve matters from the fire-risk point of view.

The trouble manifested itself by frequent fuse blowing, red fuse always, on a 10-light circuit; and I am advised that the fuse would sometimes blow when all the lights were off. Insulation resistance tests varied considerably during unlooping for elimination purposes, and the rubber insulation was perished at the ends of the conductors. After spending considerable time trying to locate this elusive fault, without any really positive result, my informant remade all connections, replaced fittings, etc., and got a reading of 500,000 ohms. Although this value is, in fact, only one fifth of the permitted minimum, he decided to risk it and leave the circuit live, but as the fuse-blowing trouble persists, something drastic must obviously be done to make the wiring safe.

Customer Not Always Right

The crux of the matter is that the consumer is unwilling to bear the expense of a complete rewire, being under the impression that it should be an easy matter to locate a more or less positive short circuit, and that as the wires have never been disturbed since the date of installation, then their useful life should not yet have been passed. It is not such an easy matter for a contractor to deal tactfully with a valued customer who adopts this attitude in all good faith, but it would be extremely foolish to accept any responsibility for the installation as it is left at present; and this should be made quite clear to the customer. It is always a difficult matter to forecast with any degree of accuracy the life of an installation, as so many factors have to be taken into consideration.

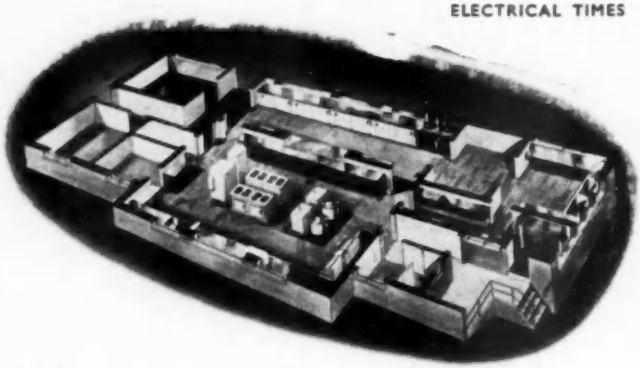
On general principles, I should never have used t.r.s. or any similar wiring system for the building in question, on account of the fire-risk involved. I rather suspect that the cables have been fished into inaccessible floor or loft cavities, or strung across narrow channels cut in the floor joists, and that the lack of adequate supports is responsible for part of the deterioration which has taken place. This was quite a common practice until fairly recently, and it is interesting to note that whereas it was formerly permitted to space the supports up to 10 ft. apart, this figure has been reduced to 3 ft. in the 12th edition of the I.E.E. wiring regulations. It should also be remembered that the above spacings refer to cables under floors, or within partitions, not likely to be disturbed. They do not refer to open runs where 15 in. to 21 in. for vertical, and 9 in. to 18 in. for horizontal directions are specified, according to the size of cable used.

Causes of Damage

Another point frequently overlooked is the necessity for easy bends when a change of direction is required. The radius of the inside of the bend must not be less than four times the diameter of the cable, and, if due to the change of direction, there is likely to be excessive pressure on any part of the cable, it should be taken over a rounded support of not less than six times the diameter of the cable. Vertical cables should be gripped firmly at the points of support.

With an old installation, as in the present instance, it is often almost impossible to trace the original runs and it may well be that some damage has been caused over the years by a loose floorboard, or it may be due to rats. It has always been a mystery to me why these rodents should show this preference for what one might expect to be very unsuitable fare, and various theories have been put forward from time to time. I am rather inclined to agree with those who suggest that an attack is most likely to occur when a cable-run happens to restrict what the rat considers his right of way. This is borne out by an experience related to me by a ship's engineer, who twice had a lead-covered cable badly damaged after taking it though a hole in the deck by the mast. Finally, in desperation, he drilled a spare hole at the side and experienced no further damage.

FOOD AND THE FLOW LINE...



Lotus Ltd.'s new all-electric canteen provides a notable example of kitchen planning

BY courtesy of Messrs. Lotus Ltd., we recently had an opportunity of inspecting the all-electric canteen at their new Stone (Staffs) factory. Planned by The Simplex Electric Co., Ltd., in conjunction with the architect, Raymond Hawkins, L.R.I.B.A., and capable of cooking for some 400/500 persons, this canteen presents several unusual features and approaches more closely to the ideal principles of planned flow than any we have yet seen.

Equipment

The equipment installed and the loading per unit is as follows :

2	Creda double ovens (each oven 8 cu.ft.) ranges	each	18·5 kW
2	Creda 6 cu.ft. steaming ovens	each	9 kW
4	Creda 6 ft hot cupboards	each	5·1 kW
1	Creda sectional grill		5·25 kW
2	Smith & Wellstood 20 gal. boiling pans	each	9 kW
1	Rouse 2-pan fish fryer		24 kW
1	G.E.C. 2-deck pastry oven		9 kW
1	Proving oven		0·5 kW
1	Stott cafe set, 160 pt/hr.		10·7 kW

The total connected load is, therefore something over 140 kW, but it is not anticipated that the m.d. will exceed the normal figure of 40% connected load. In addition there are, of course the usual dish-washer, mixing machine, potato-peeler, and the compressor unit for the 200 c. ft cold room.

The finish throughout is in two-tone ivory vitreous enamel, kitchen machinery and equipment by other manufacturers having been supplied unfinished and enamelled by Simplex Ltd., to ensure exact colour matching.

Layout

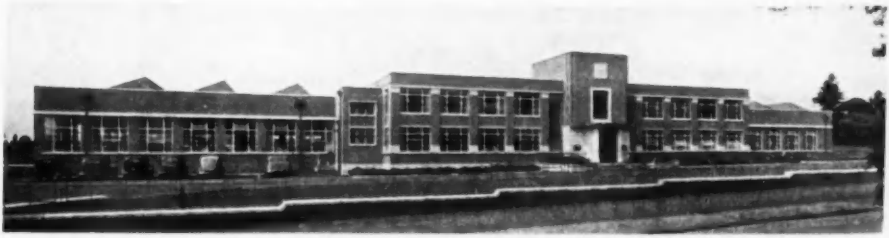
As is customary the canteen has been designed for cafeteria service, and the service counter is constructed of stainless steel in one length. A departure from normal practice is that the tops of the hot-cupboards underneath the service counter are lagged, so that the counter remains cold, to enable ices and cold sweets to be served in good condition. A separate hatchway is provided for the return of used crockery which is delivered direct to the wash-up room, whence it is returned to the crockery store between the wash-up room and the servery so that it circulates without impeding service.

Roller shutters are provided at both front and back hatchways of the servery so that for evening functions the kitchen can be left locked up while allowing the use of the servery. Normally both sets of shutters are raised so that a clear view is given of the entire kitchen from the canteen proper. This, we consider, is far more likely to engender confidence than attempting to hide the kitchen and is, of course, perfectly practicable with an all-electric installation.

Following flow-line principles, the vegetable store and vegetable preparation rooms adjoin, and are next to the "wet" cooking appliances, (i.e., boiling pans and steaming ovens) which are arranged at one end of the island site in the centre of the kitchen, and are surrounded by a gulley in the floor. The fume canopy, instead of the usual galvanised iron, is made of wired glass, thus allowing the maximum of natural light, while watertight fittings are installed inside the canopy for night-time use.

We are indebted to Mr. J. A. Britton (general manager of Lotus Ltd.'s Stone factory) and Mr. L. H. Carmalt (manager industrial cooking and heating division of Simplex Electric Ltd.) for their assistance in compiling the information contained in this article.

The electrical contracting was carried out by Electrical Installations Ltd.



The new Lotus factory at Stone

. . . A PLAN TAKES SHAPE

Left: Exterior view of canteen building. Right. Close-up view of washing-up room

Left: Crockery stores and washing-up room seen from servery. Right: View of kitchen from the main canteen

Left: Servery, showing 24 ft. stainless steel counter. Right: View of kitchen from serving hatch

Two views of the kichen "island" equipment from dry and wet end

overseas news

Hong Kong Plan

To meet increasing demand, the Hong Kong Electric Co., which supplies power throughout the island, has arranged to install a further 20,000 kW turbine and two 150,000 lb/hr boilers. The latter are to be arranged for oil firing. It is hoped that this plant will be in operation about the middle of next year, and will greatly relieve the supply situation.

Extension in South Australia

A Bill to facilitate the extension of electricity supply to sparsely settled areas of the State, by the Electricity Trust of South Australia and by local governing bodies, was introduced in the Assembly recently by the Minister of Agriculture, Sir George Jenkins. The Bill is intended to give effect to the Government's policy of providing for such extensions. For extensions by the Electricity Trust, the Bill enables the Treasurer to make grants out of general revenue to the Trust, up to a total of £1 million, for generating and transmitting electricity to sparsely-settled areas. A clause dealing with the acquisition and extension of electrical undertakings by municipal and district councils provided for any council, or any number acting jointly, to submit to the Minister of Local Government a plan for such an undertaking. If a plan were approved, the council would have the power to borrow the necessary money, the Treasurer providing a 50% subsidy out of general revenue.

Power from Snowy

The first power to be produced by the Snowy Mountains scheme will be fed into the electricity supply system about six years ahead of schedule, Mr. W. Hudson, commissioner of the Snowy Mountains Hydro-Electric Authority, stated a few days ago. Work on the £220 million project was progressing so smoothly that the amount accomplished in the first year approached double that planned. The Authority has collected about £1,000,000 worth of machinery and plant, and further equipment and stores, valued at £750,000, was on the way. The Authority will table its first report this month.

New Factory

A 10½-acre factory site in Campsie, New South Wales, has been purchased by the Cooper Engineering Co. Pty. Ltd., who plan to build a £1,000,000 plant for the extension of their manufacture of household electrical equipment. The firm plans to start building the first section of the factory next year and to complete the project within the next five years. The company, which is a subsidiary of the Sunbeam Corporation of Chicago, has been established at Sydney for about 40 years.

Ferreting it in

A ferret, enticed by meat, recently helped lay a pilot cable for the Electricity Trust of South Australia along South Road, Adelaide. It was the first time the Trust had used a ferret for cable-laying for 30 years. The ferret, with a light line attached to it, was put down at one manhole and meat at the next manhole enticed the animal along the duct. With the light line pulled through by this method, it was then possible to lay the pilot cable. This occasion brought to mind a previous instance when the Trust used a ferret. Then, it was put down a manhole to run a light line under North Terrace, Adelaide. By the time the ferret was recovered he had crossed the terrace about a dozen times, laying lines in each of 12 holes! We wonder how many remember the early days when the use of ferrets was a common practice.

Quebec Developments

The Quebec Government has given approval to the plans by the Aluminium Company of Canada to expend $30 million on the initial development of a 60,000 h.p. hydro-electrical plant, by the Ibonka River in the Lake St. John district, Premier Duplessis has announced. The project will involve the ultimate development of several hundred thousand horse power and has been authorised by legislature. The Government is also studying proposals for hydro-electric production in the Gaspe Peninsula, which would give impetus to the development of copper deposits. The Premier also disclosed that Price Brothers and Co. had applied for authorisation to develop a 60,000 h.p. plant in the Lake St. John-Chicoutimi region. The Government, he said, is inquiring into projects for hydro-electric development on the Magpie River, which flows through the old Mingan Seigniory.

Another Ontario Plant

The Chenoux power development of the Hydro-Electric Power Commission of Ontario will begin supplying power by mid-November—a month ahead of schedule—it has been announced. Situated at Du Fort, about 60 miles downstream from Des Joachims, the station will initially house two 20,000 h.p. units, but it is planned to install a further six similar sets by June of next year. The scheme involves the construction of four dams, two being 1,400 ft long, another 1,100 ft, and the fourth 100 ft.

Rural Electrification

The Manitoba Power Commission's rural electrification programme advanced rapidly during the month of August, according to W. D. Fallis, general manager. In that month a supply was made available to 629 more farms.

Niagara Work

On-the-site work on the new $200,000,000 Queenston (Niagara) a power project of the Hydro-Electric Power Commission of Ontario, is to commence early next year. Camps are now being set up to accommodate workers, and machinery moved into the area. Completion date is set for 1953.

Winnipeg to Extend

September has come and gone without any power agreement between the Winnipeg City Hydro system and the province of Manitoba. As a result, the Winnipeg authorities have now decided to extend their Amy Street station.

B. C. Report

The annual report of the British Columbia Power Commission shows a surplus on the operations for the year 1949 of $1,199,959. Revenues for the year of $3,267,469 showed an increase of $717,206 over the previous year. Operating expenses, at $2,067,509, were up $386,503. The Commission's generating capacity, due to the opening of the second section of the Campbell River plant and the addition of smaller plants, has increased from 69,583 to 121,855 kVA.

India's Production

The continued expansion of Indian electrical manufacturing industry is reflected in production figures, just released, covering the first half of 1950. During that period, a total of 7,345,000 electric lamps were produced compared with 13,565,000 during the whole of 1949. Corresponding figures for electric motors were 35,209 h.p. and 69,547 and for transformers 79,603 kVA and 103,133 kVA respectively. Motor car batteries alsoincreased to 97,650 during the six months, as against 111,000 in 1949, but production of dry cells was below the level attained in the previous year.

Afghanistan Schemes

Planning for and preliminary work is continuing on the Sarobi hydro-electric scheme, Afghanistan, which it is hoped in the first stage will provide an output of 22,000 kW and at the second stage for another 44,000 kW, for which the German firm of Siemens Schukert are acting as consulting engineers. The project envisages a dam 18 metres high across the Kabul River and a tunnel of about 2½ miles through the hills. Before work starts on the dam and main tunnel, however, the river will have to be diverted through one or two tunnels under the hills on the north bank. Dr. Eberlein, a German who is supervising the project, has stated that, provided no difficulties are encountered, the work should be finished by the end of 1953. It is understood that the Siemens report on the Sarobi scheme should be completed shortly, and tenders will then be called for equipment.

There is also a plan for the construction of a small hydro-electric station at Girish, in the Kandahar Province, where it is proposed to utilise a 20 ft head of water by installing 4,500 kW of generating plant.

Secondhand Machinery to India

Under a recent amendment to India's import control regulations, it is notified that applications for the import, under the Capital Goods Scheme, of secondhand or reconditioned machinery must always be accompanied by a certificate from a firm of consulting engineers indicating the age of the machinery, its present condition and probable unexpired life. It is also suggested that photographs of the machinery to be imported should also be supplied if possible.

Kafue Gorge Scheme

The first phase of a survey in connection with the Kafue Gorge hydro-electric scheme, Northern Rhodesia, has just been completed. Technicians have surveyed the Lukanga swamps west of Broken Hill. In the first stage of the project there swamps would be converted into a reservoir to control the flood water of the Kafue River. Then a dam will be constructed at Meshi Teshi, the third stage being the gorge power scheme itself.

Power for Egypt

Urgent steps are now being taken by officials of the Egyptian Ministry of Public Works, to prepare for the completion of the North Cairo power station by 1953, the cost of which is given as £E4,500,000. At the same time, work has started on the preparation of plans for the construction of another station at Talkha, at a cost of £E2,900,000. This station is to be completed by 1955. The Ministry has also prepared plans for the construction of other power stations throughout the country so that it would be possible to supply municipal and village councils with all their needs of electric power at cost price. One of the most important of these schemes is for the construction of a power station in South Cairo at a cost of £E7 millions. There is another scheme for building a power station on the Mahmoudia Canal in Alexandria, which would cost £E4 millions. In addition, plans have been prepared for linking up all the power stations. The credits needed for all these schemes amount to £12,500,000.

Faster Travel

When the winter timetables of the French Railways are introduced next weekend, the whole of the main line from Paris to Dijon, a distance of 196 miles, will be changed completely to electric traction. The stop at Laroche will be cut out, and the services to the Riveira and the south-east generally will be accelerated. Most fast trains will do the Paris to Dijon journey in two hours 32 minutes, at an average speed of 77 m.p.h. The train to Marseilles will cut its schedule by an hour, covering the 536 miles in just under nine hours, at an average speed of 60 m.p.h. The schedules of the Blue Train and other trains to the Riviera, the Paris-Rome express, and the Simplon express will also be cut.

PERSONALITIES

IN THE INDUSTRY

At the opening of the 1950-51 session at University College, the following change was announced: **Professor H. E. M. Barlow** B.SC. (ENG.), PH.D., M.I.E.E., A.M.I.Mech.E., has been appointed to the Pender Chair of Electrical Engineering on the retirement of Professor R. O. Kapp. Professor Barlow has been Dean of the Faculty of Engineering at University College since 1949 and was a Professor of Electrical Engineering from 1945. Educated at Wallington Grammar School, City and Guild's Engineering College and at University College, the Professor received his early practical engineering training with the East Surrey Ironworks and Barlow & Young Ltd. He returned to University College, where he has held several appointments as lecturer and leader. During the war years, he joined the staff of the T.R.E. in 1939, to work on radar development and was Superintendent of the Radar Department of the R.A.E. at Farnborough, from 1943-1945.

Mr. W. S. Steel

Prof. H. E. M. Barlow

Recent appointment to the board of the British Thomson-Houston Co. Ltd., is that of **Mr. W. S. Steel,** B.SC.(ENG.), M.I.E.E., A.M.INST.MAR.E., who took his seat as a director on October 2, 1950.

Mr. Steel, who was born in South Africa, graduated in Mechanical and Electrical Engineering at the Witwatersrand University. He was awarded the Vice-Chancellor's Gold Medal at the conclusion of his studies.

He later joined B.T.H. as a student apprentice at Rugby. In April, 1930, when he had completed the course he became an assistant in the a.c. engineering department and was the B.T.H. guarantee engineer in the turbo-electric ships *Platano* and *Strathnaver*. This was followed by appointments in the industrial sales department.

In 1937 Mr. Steel went to South Africa as engineering representative of B.T.H. On his return to the U.K. in 1940 he held appointments with the Ministry of Labour and National Service, becoming in 1942, Regional Controller of the Ministry of Supply in Wales.

He returned to B.T.H. in September, 1943, to take over Admiralty work in the marine department; being appointed manager in 1944. In December, 1946, he was appointed manager B.T.H. home sales and elected a director of the B.T.H. Export Co. in 1948.

Always interested in the technical training of engineers, Mr. Steel has been a member of the B.T.H. apprenticeship committee since August, 1947. He is also vice-chairman of the I.E.E. Rugby Sub-centre.

Newman Industries Ltd. announce that **Mr. H. Copping,** M.I.E.E., is joining the company on November 1, as general sales manager of the electrical equipment division operating from Yate, nr. Bristol. Mr. Copping was with George Ellison Ltd. He was area sales manager for Yorkshire and Lincolnshire, at their Leeds office. He inaugurated their Scottish branch office in Glasgow in 1933 and later was with the Yorkshire Electric Power Co. as a junior installation engineer. Mr. Copping is at present on the committee of the North Midland Centre of the I.E.E. and past chairman of the utilisation group in that centre. He is also vice-chairman of the Leeds branch of the Incorporated Sales Managers' Association and member of the Association of Mining Electrical and Mechanical Engineers. **Mr. E. A. Parr-Dudley,** A.M.I.E.E., will continue to operate as the London sales manager of the electric equipment division.

Mr. W. A. Ankerson

Mr. H. Copping

In succession to **Mr. J. W. Bell,** who will continue to act in an advisory capacity, **Mr. W. A. Ankerson,** B.SC. (ENG.), A.M.I.E.E., has been appointed manger, Dominions Dvision of the Metropolitan-Vickers Electrical Export Co., Ltd. Joining the firm in 1932 as a college apprentice, he later served in the motor engineering department. In 1936 he transferred to the M.V. Electrical Exports Co., and went out to the Shanghai office as a sales engineer, becoming manager of the office in February, 1938. Early in the war, Mr. Ankerson succeeded in getting to Hong Kong, later to Singapore, and thence to

Sydney, Australia, whence he was seconded to the Australian General Electric Pty. Co., as chief industrial motor designer. In 1946 he rejoined the M.V. Export Co. and returned to his original post in China.

We hear that **Mr. Leslie Gamage,** who is vice-chairman and joint managing director of the General Electric Co. Ltd., is making a five weeks' business trip to Canada.

He sailed from Liverpool in R.M.S. *Empress of Scotland* on October 3, and was accompanied by the Hon. Mrs. Leslie Gamage.

Mr. Gamage will visit Quebec, Montreal and Vancouver and his visit will culminate in an address to the Canadian Club, Montreal, on October 30, entitled "Britain's Industrial Recovery." We understand that his speech will be broadcast.

Tribute was paid to the service of two pioneers of the West Country's electricity supply industry at a recent ceremony in Exeter by Mr. J. F. Steward, chairman of the S.W. Electricity Board, when he presented long service certificates to **Mr. W. J. Oxenham,** M.I.E.E., who is district manager of the West Devon area centred on Bideford and **Mr. F. J. Green,** wiring foreman at Paignton.

Mr. Oxenham, who has 44 years' service to his credit, began his career with the Electric Supply Corporation at Exmouth. He was in 1922 appointed engineer and manager to the Bideford and District Electric Supply Co. He is also treasurer of the local branch of the I.E.E. Mr. Green started in the industry as an apprentice with the Paignton Electric Light and Power Co.

New assistant station superintendent at Poole is **Mr. S. C. Irving,** A.M.I.E.E., formerly station superintendent at Hounslow generating station.

Mr. S. C. Irving

Born at Bowness, on Windermere, and educated at Southport College, Mr. Irving took up an appointment at Southport power station. He left there in 1929 to join the staff at the Valley Road station at Bradford. Later he was control engineer and relief charge engineer at Croydon. In 1937 Mr. Irving was appointed charge engineer at Bankside, London, leaving there in 1942 to take up position as assistant superintendent at Hardingstone Junction. In 1946 he commenced duty as station superintendent.

Many of his friends in the industry will join with us in wishing **Mr. F. Quartly** many years of happy retirement. Mr. Quartly, who was head of Collections and Credits Division of the Secretary's Department of the British Thomson-Houston Co., Ltd., retired on September 30 after 41 years' service with the company. He joined B.T.H. after five years with the American General Electric Co., at Lynn, Massachusetts, and during his first nine years with the company he was in the Turbine Estimating Department. From 1918 until 1934 he was in the Contract and Turbine Sales Department. It was in April of 1934 that he succeeded Mr. J. Simpson as head of Collections and Credits. Mr. Quartly was the company's representative on the B.T.H. Recreation Club Council from 1935 until this year. He also took a great interest in the B.T.H. military band of which he was chairman until this year.

For the past 12 years a sales executive of Thorn Electrical Industries, Ltd., **Mr. R. R. Coventry** has now joined the Stella Lamp Co., Ltd. as sales manager. He has now taken up duties at the company's new sales administrative offices at 37-39 Oxford Street, London W.1.

Mr. R. R. Coventry

Under an agreement between Rootes Ltd. and the Plessey Co., **Mr. E. J. Earnshaw,** M.A., M.I.E.E., A.F.R.Ae.S., has now been released by Rootes to undertake duties in the aircraft industry. In consequence, Mr. Earnshaw has been appointed a director of the Plessey Co. as from October 1 this year.

The 1949 Welding Research Prize of £100 has been awarded by the British Welding Research Association to **Dr. K. Winterton, Mr. J. G. Ball** and **Mr. C. L. M. Cottrell** for their joint paper, "A New Weldability test for Magnesium Heloy Sheet." The prize was donated by the British Oxygen Co.

Twelfth president of the British Institution of Radio Engineers is **Mr. Paul Adorian,** assistant managing director of Broadcast Relay Services Ltd. Mr. Adorian joined the Rediffusion group in 1932 as development engineer, and was appointed chief engineer in 1936. His main work has been on the development of relay systems and industrial electronics and he has been directly associated with work on synthetic training methods for airmen. He was a member of the British Air Commission to Washington in 1942-43 and 1944.

Mr. J. S. Warren, of E.M.I. Sales and Service Ltd., is the new chairman of B.E.A.M.A.'s Domestic Electrical Appliances Section following on the death of Mr. F. G. Nisbett. Mr. Warren was vice-chairman of the section, a post which will now be filled by **Mr. F. L. Humber** of Ferranti Ltd.

Educated at Wrekin College, Salop and Balliol, Mr. Warren gained much of his experience at a London business house where he ultimately became import manager. He was later associated with the refrigeration industry. After being invalided from the Army in 1942 Mr. Warren

joined H.M.V. Household Appliances, for which E.M.I. Sales and Service is the distributing organisation.

Mr. C. E. D. Catley, has now been appointed as personal assistant to Mr. J. Bowthorpe, managing director of Bowthorpe Electric Co. Ltd. New representatives of the company are **Mr. Dennis Jackson** whose area includes : North and South London, Sussex, Surrey, Shropshire, Staffordshire, Worcestershire, Warwickshire, Leicestershire and Northampton; and **Mr. T. J. Smith,** whose area includes S.E. and Central London, the counties of Hertford, Kent, Essex, Derby, Nottingham, Lincoln, Norfolk, Cambridge, Huntingdon, Bedford and Suffolk.

Owing to pressure of business, **Mr. W. A. M. Allan,** A.C.G.I., M.I.C.E., has relinquished his appointment as Hon. Secretary to the Engineers' Guild as from September 30. Mr. Allan who is an Assistant Divisional Engineer with the London County Council has been honorary secretary to the Guild since 1939.

In his place, **Mr. J. H. W. Turner,** B.Sc. (Econ.), B.Sc., A.M.I.C.E., has been elected. He is hon. Editor of the Guild's Journal and a member of Council since 1946. Mr. Turner has served as Chairman of the Discussions and the Branches Committees. He will continue as Editor of the Journal.

WILLS

Mr. F. G. Nesbitt, a director and joint sales manager of the Simplex Electric Co., Ltd. who died on May 24 last, left £10,697 14s. 10d. gross, £7,314 12s. 11d. net value.

Mr. G. J. Hollyer, M.I.E.E., sub-manager of the Torquay and West Devon area of the South-Western Electricity Board, formerly engineer and manager of Torquay Corporation electricity undertaking, deputy electrical engineer of Walthamstow electricity undertaking, and borough electrical engineer and manager to Loughborough undertaking, who died on April 15 last, aged 65 years, left £9,392 19s. 10d. gross, £9,167 15s. 6d. net value.

Mr. H. G. Cotsworth, M.I.E.E., A.M.I.Mech.E., a former head of the Electrical Engineering Department at Wigan and District Mining and Technical College, who died on March 5 last, aged 79 years, left £3,788 7s. 6d. gross, £3,299 3s. 7d. net value.

Mr. Albert Lister, of Sankey, Warrington, an electrical engineer, who died on April 3 last, left £9,092 15s. 10d. gross, £9,027 19s. 11d. net value.

NEW LITERATURE

The Britannica Book of the Year 1950

edited by John Armitage

COMPREHENSIVE in its scope and written by many leading authorities, this annual is virtually an encyclopaedia in itself. Events of 1949 and developments in the worlds of science, industry, art, religion, law and sport are well covered.

On the electrical side, information is given about the general trends of research and brief statistics of development both in this country and also in the United States. General information is also provided dealing with power development in the Commonwealth and in Europe. Published by Encyclopaedia Britannica, Ltd., 90 Dean Street, London W.1. 718 pp., 11 in. by 8 in. Price £2 10s.

British Railways and Economic Recovery

by Kenneth N. Johnston, M.A.

IN one of his stories, Kipling gave us the motto of an international transport organisation, the words "Transportation is civilisation." That this is true in fact, there can be little doubt. It is further implied that transport must not only move and develop to suit the changing circumstances and development of a progressive community, but also that it is a fundamental requirement of prosperity. These points are elaborated in detail in Mr. Kenneth H. Johnston's book, dealing with British Railways, and particularly with those regions north of the Thames. Although in part a scathing attack on the lack of foresight, self-interest, inert administration and non-appreciation of technical development on the part of these regions, the book yet is intensely interesting in view of the constructive suggestions for main-line electrification and inter-regional co-ordination put forward. On the face of it, the reader will, however, be amazed and appalled at the revelations given of past dilatoriness and deliberate obstruction to progress on the part of the railways, which have resulted, in the Author's view, in the present high freight and passenger rates and the heavy financial losses now being borne by the taxpayer. Although the book has a tendency to repetitiousness, and advances political theories of a distinctly partisan character, there can be no doubt that from a technical viewpoint the Author knows his subject.

This is a book which is worthwhile reading by all interested in the economics of railway transport, in political economy generally, and in the future well-being of the country. Published by Clerke and Cockeran, Fleet Street, London E.C.4. 352 pp. 8¼ in. by 5¼ in. Price 18s.

Laxton's Builders' Price Book

THIS hardy annual appears in its usual form, although a considerable amount of revision has been necessary. It provides a ready reference to the ruling prices of services and commodities used in the building industry, including some electrical equipment. With its extensive list of brands and trade names, it should again provide an invaluable source of reference to those concerned with the trade. Published by Kelly's Directories, Ltd., 960 pages, 7⅛ in. by 4¾ in. Price 30s.

The BUYER'S *Column*

A New Type Universal B.S. Plug

ANNOUNCED by BRITISH JEFFREY-DIAMOND LTD., of Slennard Works, Wakefield, Yorks, is the introduction of a new type of universal electric flameproof 100 amp. restrained type plug, designed in accordance with B.S. 279/1947. This new model is particularly suitable for use in medium voltage systems requiring a readily attachable and detachable cable entry, and has been designed principally for use underground with coal cutters, conveyors, outlets from gate end panels, room switches, and other control units. It may, however, be also used to good advantage in other industries. It is universally applicable to trailing cables in accordance with B.S. 708/1950.

The outstanding feature of design is that the plug can be automatically fitted to 3-, 4- or 5-core cables of the following types without any adjustment to the components of the plug having to be made :—

(1) Pliable wire armoured cable.
(2) Collectively screened cable.
(3) Individually screened cable.
(4) Cab tyre sheathed cable.

To ensure complete electrical continuity, adequate provision is made within the plug for the accommodation of the whole of the cable cores, screening, or wire armour.

The components of the plug are so arranged that partial assembly can be carried out in stages as the various connections to the cable are made. Each connecting point is completely accessible during this process, which allows the connections to be made easily and efficiently, thereby considerably decreasing the time normally taken to perform a similar operation.

The B.J.D. plug is robustly constructed to withstand the severe conditions of service to which it must necessarily be subjected underground. The body portions are cast in phosphor bronze, permanently non-rusting, which is an important feature in regard to earthing.

The B.J.D. Universal B.S. plug is covered by Ministry of Fuel and Power Flameproof Certificate No. FLP. 2528/1.

"Smoking" yet not Smoking

AT last an electric smoking kiln has been produced which does not permit any smoke to escape from it. Fishmongers, butchers and poultry dealers will be impressed by the cleanliness and efficiency of the new "Myzer" kiln, which is manufactured by FRANKURE CO. LTD., 53 Long Lane, Smithfield, London E.C.1.

The overriding advantage of this kiln is that it consumes its own smoke—not one trace escaping—thus making it suitable for installation as part of the furnishings of any retail shop.

In the form of an attractive black and cream cabinet, the kiln stands 7 ft high, is 3 ft wide and 2 ft deep. It is driven by an $\frac{1}{8}$h.p. electric motor.

Curing is carried out by igniting a small quantity of oak sawdust in a tray placed under the kiln. The smoke is spread through the kiln by a system of fans and ducting. Thermostatically controlled at any temperature up to 190° F, the unit provides for cooling the "smoke" in hot weather. When curing has been completed the "extractor" is switched on, clearing the cabinet of all fumes in 20-25 minutes.

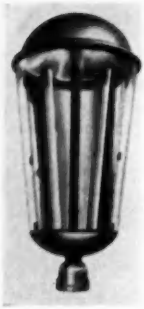
The model, which is reaching the home market now, retails at £125, but is available for hire or on hire purchase terms. Plans are on the boards for a 60-stone capacity model and a streamlined model for export.

Price Increases

MOUNTSUN LTD., 17 Edge Street, London W.8 announce that, owing to the increased cost of raw material, they have been compelled to increase the price of the "Lido" indoor sun from £11 10s. to £12 12s., being £10 3s. plus £2 9s. purchase tax.

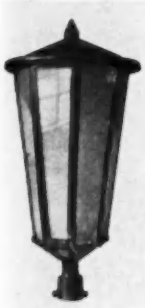
The Myzer electric smoking kiln

A.P.L.E. Exhibition



Left: Bleeco vertical lantern

Right: Revo A.O. 28212/1



IN our review of the exhibition held at Bournemouth on the occasion of the annual conference of the Association of Public Lighting Engineers, we regret that we inadvertently transposed the captions of the two illustrations which appeared at the foot of pages 456 and 457 in the issue of September 21.

That which was stated to be the "Bleeco" upright fluorescent lantern was, in fact, the Revo A.O.28212/1.

New G.E.C. Geiger-Muller Tubes

THE introduction of a range of Geiger-Muller tubes of various types, for the qualitative and quantitative measures of alpha, beta and gamma radiations from radio-active sources, and of X-rays and cosmic rays, has been announced by GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.

Three types of tube are available for the detection of beta radiation, all of them having a thin window, 1 in. in diameter, in the end of the tube to admit the radiation. Type G.M.2 has a "Dural" window, 0·0025 in. thick, which allows only the faster particles such as those from radio-phosphorus, to pass through. The G.M.4 tube has a "Dural" window 0·001 in. thick to admit medium energy particles, while the E.H.M.2 tube has a mica window 0·0003 in. thick (2 mgm/cm^2 by weight) which is "transparent" to the very slow particles emitted by radio-active carbon and sulphur.

The Type 2B20 tube, which has a window of the same thickness as that in the G.M.2 tube, but is 2 in. in diameter, giving greater sensitivity for use with specimens with low specific activity.

Two special tubes Type XA.1 and XK.1, have been designed for X-ray diffraction work. These tubes use a "Dural" window 0·001 in. thick to admit the rays, and absorb them completely along a 10 cm. axial path in the filling. This gives a very high sensitivity for detecting and measuring the X-ray reflections in a Debye-Scherrer type of diffraction pattern, or measuring the diffracted X-ray beams from single crystals of materials such as quartz. The only difference between the tubes is that the gas in the XA.1 is argon and in the XK.1, krypton.

An entirely different type of tube is the G.150, which is 5 ft in length and is very suitable for detecting gamma radiation. It is designed to be used at doorways or inside rooms where radio-active compounds or other sources of radiation exist. If desired, the G.150 tube may be used in conjunction with a circuit which will give an alarm if a dangerous level of radiation is reached.

TRADE PUBLICATIONS

LAMPS. Lamps of all types, sizes and for all applications are listed in an interesting and attractively designed brochure issued by Metropolitan-Vickers Electrical Co. Ltd., St. Paul's Churchyard, London E.C.4.

RADIO CABLES. Publication No. 11, 1950, "Cables for Radio Frequencies," issued by the Telegraph Construction and Maintenance Co., Ltd., gives detailed information and specifications for the various products of this old-established company.

LIGHTING FITTINGS. The advent of the season of shorter daylight is an appropriate time for a reminder of the feelings of warmth and cheer which are associated with an efficient lighting system. Metropolitan-Vickers Electrical Co. Ltd., St. Paul's Churchyard, E.C.4, have a range of many attractively designed commercial fittings which should help dispel depression. They are illustrated in the company's new catalogue.

THERMOSTATS.—The name "Satchwell" is so well known in the heating industry that we really need not say that the makers are the Rheostatic Co., Ltd., of Slough, Bucks. For those who don't know and, indeed, for those who do, the current catalogue issued by the company will prove most interesting.

LIGHTING FITTINGS. From the General Electric Co., Magnet House, Kingsway, W.C.2, we have received a revised copy of section F.1 of the G.E.C. catalogue. This section illustrates and lists the many attractive designs in lighting equipment which the company supplies.

NON-FERROUS METALS. All who have dealings with the purchase or supply of non-ferrous metals will find it almost essential to their business to have a copy of the tenth edition of the Trade Handbook issued by Charles Clifford and Sons, Ltd., Dog Pool Mills, Birmingham 30. The handbook is tab indexed into different sections giving details of weights and sizes of sheet, strip, rods and bars, wire and drawn strip, tubes and chill cast bars. A table of gauges, English-Metric conversion table and a ready-reckoner complete what is, bearing in mind the fact that it is a free issue to them, a definite "must" for buyers and trade users.

TERMINAL BLOCKS. KABI connectors and twelve-way strips which are made by Precision Components (Barnet) Ltd., 13 Byng Road, Barnet, Herts, are featured in a leaflet just issued by the makers.

Mixed-Pressure Turbo-alternators

Unusual Installation at Kingsbury Colliery

AN unusual power generating system has recently been installed at Kingsbury Colliery by the General Electric Co. Owing to an increase in the quantity of low-grade coal used for raising steam for winding purposes, it was decided to extend the boiler capacity and generate electric power on site instead of taking it from the mains. A scheme was therefore drawn up—Mr. H. W. Hollands acting as Consultant—to utilise both the direct pressure steam from the boilers and also the l.p. steam from the winding engine exhausts for power generation. Arrangements were however made to enable the colliery system to be paralleled to the B.E.A. 3·3 kV network should necessity arise.

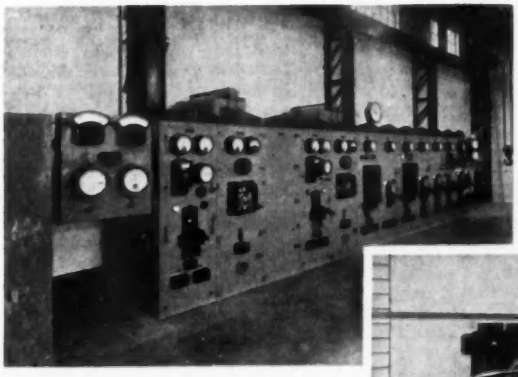
Plant

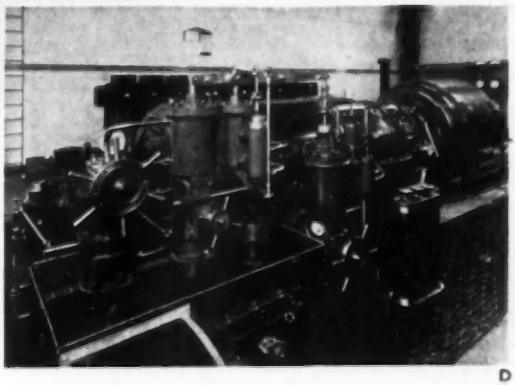
The installed plant comprises two mixed-pressure turbo-alternators each rated at 1,250 kW. The turbines run at 6,000 r.p.m. and are connected through double-helical reduction gears to salient pole alternators running at 1,500 r.p.m. Main steam supply at the turbine stop valve is 175 lb/sq in. 500° F and the low pressure supply from the winder exhaust is taken at 16 lb/sq in.abs. The mixed pressure governor gear ensures that only the minimum quantity of high pressure steam is used to supplement the low pressure supply at any loading.

Worthington Simpson surface condensers with an area of 2,100 sq ft are used, each set having its own auxiliaries, although an additional stand-by extraction pump is provided, and provision is also made for a third standby circulating water pump. The piping is so arranged that any pump can work with either set. Extraction pumps of the vertical spindle type are driven by 2·5 h.p. squirrel cage motors and c.w. pumps are driven by 64 h.p. drip-proof squirrel cage motors, the water itself being cooled by a concrete tower adjacent to the turbine room.

The main switchboard in the turbine room is of the truck cubicle type consisting of 12 panels, and is equipped with manually-operated oil circuit breakers of 25 MVA breaking capacity. Brown Boveri automatic voltage regulators, control the output voltage of the alternators to ±0·75% from no-load to full load.

At the moment the electrical demand of Kingsbury Colliery can be met by a single turbo-alternator, the second set being used as a stand-by. A 3·3 kV overhead feeder to Birch Coppice Colliery is, however, now being built, and when this is complete, both machines will be needed to meet the additional load.





Above can be seen the neat 3.3 kV 25 MVA switchgear arrangement located in the turbine room and, on the right, is a view of the special mixed pressure valve gear and relays

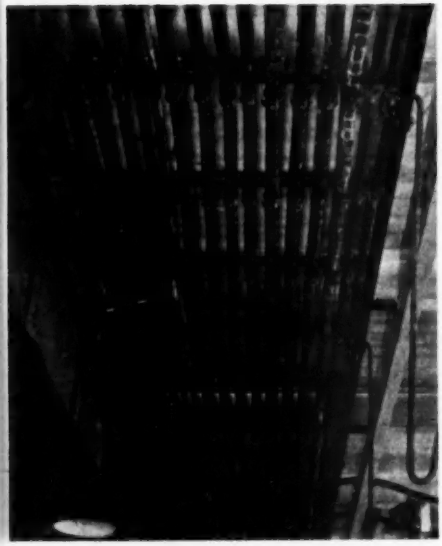
D

CLOSE RUN CABLES

Adjustable cleat facilitates both installation and modification

WHERE runs of conduit or cable have to be supported from angle or channel steel sections, some ready means of fixing is required if the need to drill the steel is to be avoided and costs be kept down. An accessory specially designed for this job is the "Fastfix" cleat, patented by Troughton and Young Ltd., which that firm has used with success on several of their large contracts.

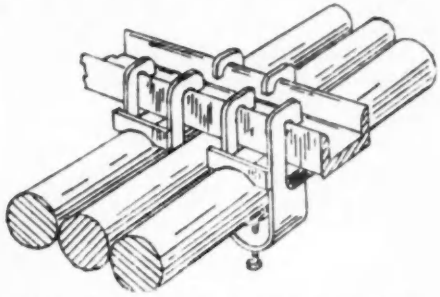
As may by seen from the illustration, the cleat comprises a U-shaped member provided with claws which hook over the edge of the steel section, and a curved shoe which is screwed down on to the conduit to be supported, and



Close packing of cables in this ceiling run is facilitated by "Fastfix" cleats

then fixed in position by a locknut. Where cables are being installed, provision is made for a shaped pad to lie between the channel iron and the cable to ensure a good bearing surface.

Naturally, since the design has been prepared by the engineers who use the finished article, due attention has been paid to the problems of erection and maintenance. By placing the cleats alternately on either side of the supporting member, a very close spacing of conduit or cable can be obtained, which is an important factor where multiple runs have to be carried out in a restricted space. Further, only the slackening of a locknut is required to permit the ready withdrawal of any necessary cable, con-



The cleat readily clamps to channel sections

duit or pipe without affecting the rest of the run. The photograph of a run at the Lune Mills of Jas. Williamson and Son Ltd. (*Electrical Times*, 13 October, 1949) shows the application of these features.

SIMULTANEOUS SHOT FIRING

IN stone drifts, sinking pits and in rippings the firing of shots simultaneously is permitted with certain safeguards and it is important that as far as possible misfires be eliminated.

Safety in Mines Research Paper No. 107 (obtainable from H.M. Stationery Office, price 6d.) gives an account of the electrical properties of low tension detonators which affect their firing when connected in series in a round of shots. From these properties the appropriate characteristics of exploders to fire the whole round are deduced. It is shown that a direct current machine need have only a small output compared with that of an alternating current machine to give the same reliability of performance. It is further shown that a condenser discharge combines the advantages of direct current firing with limitation of current in the interests of safety. Data are given from which it is possible to estimate the voltage and capacity needed to fire a round consisting of a given number of shots whilst taking the greatest precautions to limit the danger of igniting an explosive gas mixture. It is made clear that it is practically impossible to produce a multi-shot exploder to fire more than about six shots which will not ignite methane-air mixtures.

It is pointed out that shotfirers ought to have an ohmmeter or some other means of knowing when the resistance of a round is high.

THE WEEK

INDUSTRY *in news* COMMERCE

An Unrestricted Christmas

AN additional order giving certain modifications of the lighting restrictions announced by the Minister of Fuel and Power on September 4 (see September 7 issue), has been released this week. The latest order removes all restrictions on the use of electricity on Christmas Day and Boxing Day in England and on Christmas Day and New Year's Day in Scotland.

The original order specified that the restrictions should be applicable to times between 7 a.m. and 1 p.m. from October 9 to October 20, and from between 7 a.m. and 6 p.m. from October 23 to January 31. There will be no restrictions on Saturdays or Sundays nor on the use of electricity generated by private supply.

Leeds objects to Light Restrictions

THAT the Electricity Board was not doing all it could to help retailers was the opinion expressed by the president of Leeds Chamber of Commerce when the new winter lighting rules were discussed at a recent meeting. The president suggested that shopkeepers should be allowed to use subdued lighting or a 60 W lamp for an agreed space. The meeting felt that there was discrimination against shopkeepers by the restrictions and it was decided to make representations to the N.E. Electricity Consumers' Council.

Power Conference at New Delhi

DETAILS of the second post-war sectional meeting of the World Power Conference, to be held at New Delhi from January 10 to 15, 1951, are available this week. Between the same dates, the International Commission on large dams will hold its fourth congress, also at New Delhi. At the former especially, the British National Committee is presenting an interesting series of papers, of which there are eight altogether. Two engineers from Merz and McLellan Ltd., F. H. Sharpe of India and E. L. E. Wheatcroft of G.B., provide the first paper on "Consideration Affecting the Planning of Electricity Supply for Irrigation and other Rural Loads." The late F. Lydall of the same firm, with C. M. Cock of English Electric and formerly with British Railways, give "Co-ordination of Power Supply for Railway Electrification," whilst "Power and Mines" comes from B. L. Metcalf, chief mechanical and electrical engineer of N.C.B.

"Electricity and Fertilisers" is dealt with by H. S. Coles and E. C. Fairhead of I.C.I. Ltd., and C. A. Cameron-Brown, agricultural electrification advisor, B.E.A., provides "Utilisation of Electricity in Agriculture and in Agricultural Processing." B.E.A. deputy commercial manager, R. Y. Sanders deals with "Power Load Planning and National Economy" and the same Authority's overseas liaison engineer, G. R. Peterson, "Development of National Power Resources in Relation to Industrial and Other Needs." Finally, Sir Arthur P. M. Fleming, director and general manager, research and education departments, of Metrovick, will speak on "The Organisation of Research—Problems of Power Generation and Utilisation."

Among British participants at the conference will be Lord Citrine and Sir Vincent de Ferranti, chairman of the International Executive Council and British National Committee. An Indian International exhibition will be held at New Delhi during January and February. Full details of the conference, including study tours can be obtained from the British National Committee, 201 Grand Buildings, Trafalgar Square, London W.C.2.

Enfield Cable Film Show

FOLLOWING the exhibition of films briefly reported in our last issue, the Enfield Cable Company showed a series of slides illustrative of modern developments in their own particular field. These included a picture of the new Enfield drum, a new aluminium cable roller; the "Drednort" Link Disconnecting Box; the Grid Suspension Wiring System; examples of cable laying and details of the 132 kV pipeline compression cable. The experimental length of 220 kV self-contained Compression Cable of 0·6 sq in. section at Clamart, near Paris, was also shown.

An interesting model of a 100 kW wind driven generator which is on order for the B.E.A., was exhibited on the stage. The wind driven three-blade assembly operates as a centrifugal blower, the power air passing up the structure and through the hollow blades. This power air, operates an air turbine driving a generator at the base of the structure.

The First Half-Century

This week we publish once more our quarterly tables of "The Progress of Electricity Supply." A noteworthy fact is that the process, formerly so common, of the acquisition of companies' works by local authorities has almost ceased. The practice now seems rather to be that the local authority, especially in small towns, applies for and obtains, a Provisional Order and then transfers it to the company.—(*From our issue of October* 4, 1900.)

General view of new lighting installation at Bonds (Norwich) Ltd.'s store

Norwich Store Lighting

A GOOD example of store lighting comes from Norwich this week where Bonds Ltd. have had 56 of G.E.C.'s F.41015 louvre fittings, specially designed for such situations, installed. Each fitting has a bronze coloured body with glass side panels and 15 of them ranged in a row on either side of the central laylight. They contain two 5 ft 80W fluorescent lamps and are suspended from the ceiling by 6 rods—rigidity being maintained by angle iron running along the tops. The central laylight is lit by two rows of nine trough reflector fittings suspended 5 ft above the glass. Another section of the store, for furnishing fabrics, is lit by 15 of the same fittings with individual chain suspensions.

E.I.B.A. Golf Championship

IN SPITE of blustery conditions and the threat of rain, which fortunately did not materialise sufficiently to interrupt matches, a high standard of golf was maintained at the E.I.B.A. National Golf Championship held this year at Addington (Surrey) Golf Club. Winner of the competition and of the Sir Montague Hughman trophy, was Mr. J. S. Davies, who returned a net score of 72. Mr. Davies came to London from the Merseyside and North Wales (E.I.B.A.) area and was only one of several winners from the north and west country. There was, however, a battle between two Londoners for the runners-up position, the J. L. Wilson Cup, which was won by Mr. A. F. Trinder of Gurneys Electric (Southall) Ltd. with a score of 74 (net). Mr. A. G. Richards also returned a net 74 but lost the trophy on the second round holes.

Best scratch score was made by Mr. A. Clarke of H. Clarke and Co. (Manchester) Ltd., who finished with a gross score of 77. He carried off the J. Y. Fletcher Cup. Finishing all square, Mr. G. Ferguson and Mr. E. C. Bachelor, both from South Wales, won the foursomes cups presented by Sir Felix Pole. The veterans' trophy, a large silver salver, given by "The Electrician," was won by Mr. J. E. Hardy, another visitor from the north-west, who completed the course with 78 (net). Last, but by no means least, Mr. S. Gee of W. T. Henley Telegraph Works Co., Liverpool, returned a net score of 82 to win the E.W.F. Visitors' Bowl.

The cups were presented by Sir Henry Self, who was deputising for Sir Montague Hughman, kept away because of illness. Each winner was given a silver tankard as a personal award. After the prize-giving an electric lantern fitting of old-fashioned design was presented to the past secretary of the Championship, Mr. A. H. Hughes, who is now in Leeds. One of the 42 competitors who asked what benefit the E.I.B.A. derived from the competition was told that in 1948 the profit amounted to £430 and last year, £525. The secretary, Mr. W. J. Bird, assured the gathering that last year's figure would be topped by a substantial margin.

Batti-Wallahs' Luncheon

PRINCIPAL guest at the Batti-Wallahs' luncheon, held last week, was Sir David Maxwell Fyfe who chose as his topic the Second European Congress. He pointed out that this organisation, which was composed of members of all parties from all countries, was not as well known to the general public as it ought to be. In order to give some idea of the calibre of the people who composed the Congress he gave a series of brief descriptions of the Members. He emphasised that these members did not represent national delegations, and that the national viewpoint was subordinated to the European good. The speaker at the next luncheon will be Lord Citrine.

Course on Protective Gear

A SERIES of seven lectures on Power System Protective Gear is to be held at the Heriot-Watt College, Edinburgh, by the college's electrical engineering department. The lectures are being given by J. L. Egginton, M. D. Kippen, and W. Sharp, engineers with the S.E. Scotland Electricity Board, and E. O. Taylor, assistant professor of electrical engineering at the College, on successive Saturdays from October 21.

The first two lectures will be on the Principles of Protective Equipment, lecture three on System Planning and Choice of Protective Schemes, and a fourth on Apparatus. These will be followed by two on the Practical Development of Protective Equipment and a final lecture on Testing and Management. Fee for the course is £2 2s., and applications should be made to the secretary of the College at Chambers Street, Edinburgh 1.

Tube Extension Deferred

L.T.E. are to defer the proposed 1½ mile extension to the Bakerloo line from Elephant and Castle to Camberwell because they have found the cost considerably more than original estimate. The total cost, including the additional rolling stock and depot accommodation, is now put at £6¼ million. In the words of the official announcement, "the project must wait until more favourable conditions prevail."

"Works Information"

A YEAR ago the F.B.I. published a booklet called "News of Industry" which was designed to strengthen industry's contact with the Press and thus make achievements better known. A similar booklet "Works Information," has now been published by the same organisation which aims at encouraging firms to keep their workers "in the picture" as to what is being done by them and the firm as a whole. It sets out a few notes on how to get the information over. Techniques covered involve notice-boards and wall newspapers, production charts, posters, works journals, handbooks and magazines, films and exhibitions. The booklet also suggests an "Open House" or "Family Day," events now taking their places in many firms' calendars. An example of one such day is quoted and the cost given as £100. Last, but not least, the booklet suggests evening meetings where workers can discuss current problems.

Public Speaking

SUBJECTS set for competitors in E.D.A.'s 1951 public speaking competition are "Leisure Hours," "Safety," "Art of Illumination" and "Electricity and Transport." The Council has also announced the raising of the age limit, and persons under 36 on March 31, 1951 will become eligible for the contest. In this way E.D.A. hopes that more areas will be able to find the necessary six entries for an area competition. A booklet containing the rules can be obtained from E.D.A. at 2 Savoy Hill, London W.C.2, and the Association has also produced a 36-page booklet called "Hints on Public Speaking" which is available to intending competitors free of charge. The latter deals methodically with all stages of speechmaking, as well as some notes on what the judges look for in the speaker and speech. To date the Faraday Silver Challenge Shields have been won by the men in the north-east and Scotland and by the women in the east and Yorkshire. At least one of the shields seems due for a stay in the south next year.

Churches Floodlit

NOW that the evenings are becoming shorter, examples of floodlighting throughout the country are more plentiful. From St. Andrews, in Scotland, and Ashby-de-la-Zouch come typical examples. At St. Andrews many historic buildings were floodlit during the 500th anniversary celebrations of the foundation of St. Salvator's College.

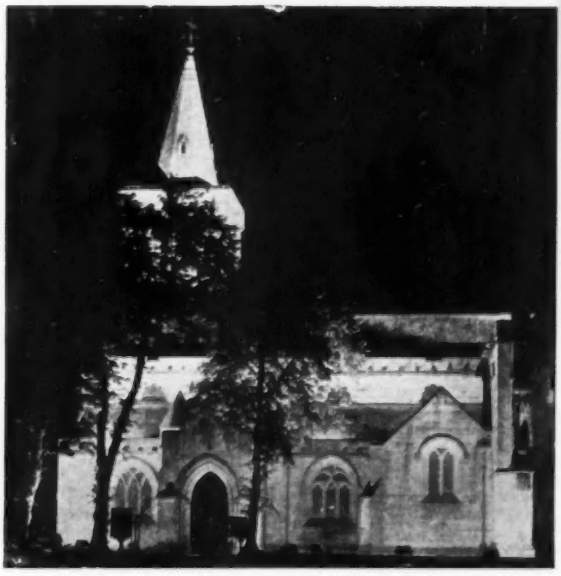
Among buildings which were floodlit were those which existed at the time the College was founded, including the cathedral, castle and church of the Holy Trinity. The S.E. Scotland Electricity Board was responsible for the installation which comprised sodium floodlights and wide angle dispersive reflectors. Specially converted marine type searchlights well brought out the architectural features, and in all 109 lighting units were used with a total loading of 63 kW.

At Ashby-de-la-Zouch a permanent floodlighting system was switched on for the first time last week at Holy Trinity Church. Contributors to a public subscription, organised originally to light up the clocks, must be pleasantly surprised at the larger system. In this case two 1,000 W beams, one focused and one diffused, pick out the clock tower as well as accentuate the newly-gilded dials.

B.T.H. at Rogerstone

THE article on the Rogerstone Mills of the Northern Aluminium Co., published last week, had, unfortunately, to be cut at the last minute

Holy Trinity, St. Andrews, floodlit for the 500th anniversary celebrations of St. Salvator's College



due to space considerations. Due to these cuts, readers may have not appreciated the amount of plant installed by the British Thomson-Houston Co. in the works. In actual fact B.T.H. were responsible for more than nine-tenths of the mill drives and ancillary equipment both for the hot and the cold rolling sections. On the hot line the d.c. motors installed include one 2,000 h.p. reversing, one 1,625 h.p. reversing, one 3,000 h.p. continuous and one 2,600 h.p. continuous, together with the associated control gear and m.g. sets; on the tandem cold-strip mill three 2,600 h.p. and one 800 h.p. d.c. motors were made by the Company and on the temper mill one 1,000 h.p. and two 220 h.p. d.c. machines are of B.T.H. manufacture. In this case as well all the switchgear and contactor gear together with the motor-generator sets were included in the B.T.H. contract.

Electricity in Australia

THE recently published economic survey of Australia (H.M.S.O., 4s.) contains many items of that country's advancements in the generation of electricity which the electrical engineer will find interesting.

In the past ten years generation has increased by 4,355 million kWh to 9,034 millions kWh, but this is still far from adequate as electricity is being used more and more in Australian houses. The diversion of the Snowy River for irrigation and hydro-electric uses (costing about £A200 million), the Clarence Gorge (N.S.W.) project and Burdekin River dam, in Queensland, are among the large projects planned in Australia. Many short-term projects have been planned in all States which are estimated to cost some £A194 million.

Electrical machinery, appliances and equipment accounted for £A17·3 million among Australian imports in 1948-49 as compared with £A10·3 million in 1947-48 and £A4·9 million in 1939. Of that amount it is significant that the U.K. supplied £A15 million in 1948-49 as against the United State's nil. In the previous year the U.S. had supplied £A1·8 million and Britain £A7·8 million.

Still on the subject of imports, the survey lists electrical appliances and equipment as totalling £A17,212,000 in 1948/49 compared with £A10,308,000 during the previous year.

Australia's manufacturing capacity will certainly be further expanded, and as a result of the plans for the widespread expansion of electricity generation projects within the next ten years, it seems certain that the demand for plant and equipment from Britain will be further increased.

British manufacturers will not find Australia an easy market, as the development of the electrical industry is continuing and there has been a considerable increase in production for domestic needs. The production of refrigerators, for example, increased from 29,000 before the war, to 145,400 in 1948-49.

It is to be noted that copper production has shown a progressive decline in recent years, the 1948 production being the lowest since 1935. Of interest also is the survey's reference to Australian steel, which is still among the cheapest in the world.

Turning to coal, the Joint Coal Board have placed orders for mining machinery to create a machinery pool, and have made it obligatory upon all collieries to replace manually-operated machines by power-boring machinery.

Finally, we read that television is to be introduced as soon as possible, with stations in each of the six capital cities. The service will provide for about 60% of the population, but it is not expected that television will be established before 1952.

Lighting in Spring Hill, Sedgley, by Revo Electric Co. Ltd., comprising 250 W mercury vapour discharge lamps (C.12627 "Silverblue"). Revo have also installed their "Sol-etern" lanterns mounted on overhead wires and each using two 80 W 5 ft fluorescent lamps in Cardiff's Civic Centre

Students' Section Dance

STUDENT and graduate members of the Institutions of Civil Electrical and Mechanical Engineers in the London area, combined on Saturday to hold a joint dance at the Victoria Halls, Bloomsbury Square. Some 350 members and their ladies were present, and they had as their principal guest at this successful function, Mr. B. G. Robins, M.SC.(ENG.), M.I.MECH.E., Assistant Secretary of the Institution of Mechanical Engineers.

Electricity on the Farm

ENGINEERS of the Yorkshire Electricity Board, whose work is to assist and advise farmers in the efficient use of electricity and electrical equipment, recently attended a course at the Yorkshire Institute of Agriculture, near York. Fifty representatives were selected from the district staff

engaged in rural development or working in rural areas. The course, which lasted a week, was designed to provide up-to-date knowledge of farming methods and covered dairy, poultry and arable farming, livestock, market gardening and fruit growing. Tours of the farm each afternoon provided the practical side, and evening film shows supplemented the day's instruction.

1950-51 Calendar

THE ELECTRICAL TIMES gratefully acknowledges the receipt of an attractive calendar from Metrovick, and reciprocates the good wishes it brings. The calendar itself requires no comment as it is beautifully enhanced by yet another lovely lady, a feature of Metrovick's calendars for many years. The company differs from the more usual practice in that its calendars date from October 1 to September 30.

NEWS IN BRIEF

The 26th annual conference of E.A.W. will be held at the Connaught Rooms, London W.C.2, on Friday, April 6, 1951. Programme includes annual meeting, lunch, and meeting of Advisory Council.

The Federal German Government has announced the extension to the U.K. and her overseas territories of a list of goods which have been given an unrestricted entry as from September 26. Copies of the list will be available at the B.o.T. shortly.

The laying of a mile-long cable from the Guernsey mainland to the Platte Fougere lighthouse off the island's north coast, has just been completed by Submarine Cables Ltd.

The Association of Steel Conduit Manufacturers held their annual conference at the Imperial Hotel, Llandudno from September 22 to 25. Mr. J. M. Surrall, of Simplex Electric Co., presided. Business over, delegates and their ladies enjoyed coach tours, dancing and a visit to the *Arcadians*.

The Council of Industrial Design have announced changes in the programme of exhibitions to be held at Murray House. Exhibitions of Office Equipment (November 22 to December 15) and Transport Furnishings (January 17 to February 14, 1951) have been cancelled. The latter will be included in the Hotel and Catering Equipment exhibition to be held from November 22 to December 15, and the programme is completed by the Sports, Toys and Souvenirs exhibition from October 11 to November 8.

This striking demonstration unit complete with shaver and mirror is available to dealers from Remington Rand. It features the new four and five headed shavers

Electric Supply News

Basingstoke

The R.D.C. has agreed to a proposal by the Southern Electricity Board for the provision of a supply by overhead lines to the Moat Close housing site at Bramley. The overhead lines proposed in Monk Sherborne have been approved by the local parish council subject to a slight diversion near the war memorial to which the R.D.C. has agreed.

In a further letter to the R.D.C. the Southern Electricity Board reported that they were unable to reach agreement with the interested landowners on the route of the lines to Pamber and submitted a plan showing a revised route.

Eastern Board

At the end of July last, the Eastern Electricity Board had over 1,300,000 consumers connected to its system, according to the latest data sheet issued. A total of over 11,400 substations were in operation, together with more than 9,600 miles of h.v. mains and 12,600 miles of l.v. mains.

Industrial and commercial consumers throughout the area of the Eastern Regional Board for industry will be required to reduce their demands during December and January by 15% between 8 a.m. and 9.30 a.m., and between 4 p.m. and 5.30 p.m. In November a 10% reduction will be required between 4 p.m. and 5.30 p.m. only, and in February a 15% reduction between 8 a.m. and 9.30 a.m. only. These reductions are less than those imposed last year except for November, in which no reduction had to be made in 1949. A 10% reduction is now required as last year electricity cuts were caused by the overlap

of industrial and domestic loads in the late afternoon.

Domestic consumers will be asked not to use electricity at the peak hours of 8 a.m. to 9.30 a.m. from October 1 to March 31, and from 4 p.m. to 5.30 p.m. from November 1 to January 15.

Fleetwood (N.W. Division)

The B.E.A. have received the consent of the Minister of Fuel and Power to the development of Fleetwood power station, Lancs, to its full capacity. Authorisation was given last June to the establishment of this station and the installation of a 30,000 kW turbo-alternator, a boiler unit with an evaporative capacity of 300,000 lb per hour and the construction of a cooling tower. The new consent covers the installation of five more 30,000 kW sets and five 300,000 lb per hour boilers and the construction of two further cooling towers. When completed the total installed capacity of the station will be 180,000 kW.

Kingston

A cheque for £23,000 has been received by the Corporation in settlement of its claim against the British Electricity Authority and the Ministry of Fuel and Power for expenditure arising from the construction of the Kingston power station. The claim was made in respect of money spent in closing down the sewage works and for damage caused to Canbury Gardens during the erection of the station.

N.W. Board

The Board plans to remove tariff anomalies in their area by the introduction of a standard domestic tariff. This will replace the two-part and flat rate tariffs by the block tariff, i.e., there are no fixed charges but units up to a certain number in each quarter are charged at one rate and the remainder at a lower rate. The higher rate charged for a relatively small number of units will be determined on the basis of the number of "chargeable" rooms in each consumer's residence. Rooms, such as bathrooms, coal stores, washhouses, pantries, etc. are not in this category.

To assess each consumer's share, without employing extra manpower, the Board are to send out postcards, a section of which is completed, detached and returned through return postage facilities by each consumer.

The new tariff will be based on the replies received and it is hoped that it will be ready for introduction by the end of 1951.

Neath

The Welsh Board for Industry is to arrange a conference of representatives from the Neath Rural Council, the South Wales Electricity Board and the National Coal Board to discuss the possible re-opening of the Aberpergwm generating station.

The station which is controlled by the N.C.B. was closed following complaints of grit nuisance but it is thought that the station would make a valuable contribution to the power needs of West and South Wales.

Penybont

An appeal by the B.E.A. against Penybont R.D.C.'s refusal to permit the tipping of ash from Llynfi power station, into Cwm Nant Gwyn Valley, Llangynwyd, a mid-Glamorgan beauty spot, has been allowed by the Ministry of Town and Country Planning. A public inquiry into the matter was held at Bridgend last June. In its finding the Ministry states that the ash produced from the Llynfi power station was at present pumped to a site at Cefn Ydfa, which would last only another year. The prosperity of industry in the area demanded an adequate supply of electrical power at economic rates. "The issue is clear and resolves itself into weighing the needs of industry against the full preservation of amenity. At present the Ministry has no doubt that precedence must be given to industrial needs."

LIGHTING SCHEMES

Baldock (Herts.).—The scheme to replace 134 gas lamps by 201 electric lamps will cost £9,000.

Boldon (Co. Durham).—The U.D.C. is to apply to the M.O.T. for sanction to install electric street lighting at Boldon Colliery. The N.E. Electricity Board, Newcastle-on-Tyne, has submitted an estimate at £6,750.

Farnborough.—The town council is to invite tenders for the installation of lighting in Hazel Avenue.

Hebburn-on-Tyne.—Plans for street lighting on the Hartleyburn Estate have been approved by the U.D.C. 28 lamps will be provided by the North Eastern Board at a cost of £1,138.

Stourbridge.—The town council has been asked to approve a recommendation to install three 80W tube fluorescent fittings in place of the existing lighting. The six four-tube fittings in High Street should remain and the installation in Worcester Street should be mercury vapour lamps.

Walsall.—Recommendations are before the town council for the relighting of Pleck Road at an estimated cost of £2,800 and Road A.34, i.e. Stafford Street, Bloxwich Road, High Street and Stafford Road, at estimated cost of £7,700.

Warton.—The Parish Council has approved a recommendation by the M.o.T. for a street lighting scheme costing £1,750, involving 35 lights

Whitehaven.—The highways committee have recommended erection of 20 lighting standards in Main Street following M.O.T. approval of the plan for installing fluorescent lighting.

West Bridgford.—With the completion of new class "A" sodium lighting on Radcliffe Road and Melton Road, the U.D.C. is now bringing side street lighting up to class "B" standard. The first section of this work on Gordon Road has been completed, using 15 ft cast-iron columns with 160 W blended lamps, a combination of tungsten filament and mercury vapour lamps.

Company Activities

Engineering and Lighting Equipment

Interim report states draft accounts of company for year ended March 31 have been prepared, but directors consider it is not practicable to finalise these accounts until certain outstanding taxation matters have been agreed with Inland Revenue. There has been a further increase in sales which has resulted in a trading profit in excess of figure for previous year. Directors do not consider, however, that company is yet in a position which justifies payment of Preference dividend arrears, owing to necessity of financing considerably increased volume of business in hand for current year. Volume of sales from April 1 to date is considerably in excess of corresponding period of previous year and orders on hand are such as to indicate that sales for year ending March 31, 1951, will be in excess of previous year. (Preference dividend paid to June 30, 1946.)

Everready (South Africa)

Net profit for the year ended June 30, 1950, £90,851 (*£118,770*). To reserve £15,109 (*£43,148*), dividend 30% £73,111 (*same*), carried forward £40,321 (*£39,190*). Current assets total £364,410 (*£406,812*), against current liabilities and provisions £106,660 (*£152,834*).

G.E.C. Ltd.

After providing for depreciation the company made a profit last year of £4,471,000, of which taxation absorbed £2,731,000 or 61%. This left an amount available of £3,950,000 and current assets exceed current and deferred liabilities by over £16 million. During the past four years £4,250,000 had been expended on additional plant and buildings. Total reserves now amount to £17,300,000. A dividend of 10% p.a. plus cash bonus of 7½% was declared on ordinary stock for year ended March 31, 1950, at annual meeting on September 28.

London Electrical and General Trust

Revenue up to June 30, is shown as £67,304 (*£63,607*). Management expenses account for £3,400 (*£3,463*), directors' fees £1,450 (*same*), audit £158 (*£157*), debenture stock trustees' fees £155 (*same*), tax £20,496 (*£18,878*), debenture interest £16,000 (*same*), leaving £25,645 (*£23,504*). To reserve £5,000 (*same*). Preference dividends £10,395 (*same*). Ordinary dividend 7% £9,240 (6% *£7,920*).

Scophony Baird Ltd.

Preliminary accounts for the year to March 31 last, show a loss of £54,547 (*compared with a loss of £13,448 for the previous year*), but after writing down certain intangible assets the overall loss is £80,100 (*£32,182*), arising out of the circumstances the company has experienced certain financial difficulties in its operations in recent months, Sir Charles J. S. King, the new chairman, states. Arrangements are therefore being made to provide the company with more finance. It is in connection with these that Sir Charles and Mr. Dugdale recently joined the board.

Strand Electric and Engineering

Consolidated profit and loss year ended April 30, 1950 (including subsidiary from October 1, 1949), shows gross trading profit £235,833 (*£196,160*) rents, etc., £634 (*£1,059*), making £236,467 (*£197,219*). Deduct expenses £139,671 (*£111,422*), research £4,752 (*£6,191*), maintenance of buildings £8,411 (*£2,737*), services as directors £550 (same), as managers £16,449 (*£13,053*), pension premiums £1,469 (*£1,985*), audit £452 (*£400*), rent and rates £6,187 (*£5,999*), interest, bad debts and depreciation £5,761 (*£5,766*) leaving group profit £52,760 (*£49,121*). To property improvements £899 (*£8,186*), taxes £26,647 (*£25,005*), leaving net profit £25,214 (*£15,930*). Transfer to general reserve £12,000 (*£6,000*), subsidiary's profit written off purchase consideration £1,097 (nil), less decrease of £104 (*£1,700*) in hire stock reserve. Net dividend £12,221 (*£11,630*). Group net current assets £87,015 (*£90,520*). Overdraft £44,459 (*£6,452*). During the year, Strand Electric and Engineering Company purchased the share capital of Implitico, Ltd., an old-established company specialising in seaside illuminations and general display lighting. After providing for all known contingencies and taxation and after transferring £12,000 to general reserve, profit for distribution to Strand Electric Holdings is £12,221, equivalent to a gross dividend of £22,219. For the fourth successive year, the directors recommend a dividend of 17½ per cent., less tax. This will absorb £11,069, leaving £6,420 carried forward.

Dividends Declared

Cape Electric Tramways (1949).—Dividend of 4% for year ended June 30.

Quebec Power. Quarterly dividend 25 cents on Common.

Thos. W. Ward Ltd. A final dividend of 10%, less tax, on the Ordinary Share Capital, making with the Interim dividend of 5%, less tax, already paid, 15%, less tax, for the year ended June 30, 1950. Ordinary general meeting October 27.

Commercial Information

CONTRACTS OPEN

HOME

Oct. 6.—Belfast. Refrigerator, 15 cu ft or new plant for existing refrigerator for Belfast City Hospital. Supplies Officer, S. Belfast Hospital Management Committee, Lisburn Road.

Oct. 6.—Sheffield T.C. Electrical installations to 630 houses and 48 old persons' dwellings on Stradbroke estate and 44 old persons' dwellings on Manor Park estate. W. George Davies, City Architect, Town Hall, Sheffield 1. Deposit £1.

Oct. 6.—Sheffield T.C. Electrical installation at Herries Rd. bus garage. W. George Davies, City Architect, Town Hall, Sheffield 1. Deposit £2 2s.

Oct. 7.—Cornwall C.C. Electrical services in conversion of Pencal-Enick House, Truro, into special school. Applications for permission to contract should be made by above date and be accompanied by short list of recent contracts. Sydney Gregson, County Architect, County Hall, Truro.

Oct. 7.—Lancashire C.C. Electrical installation at 10 houses at Huyton. County Architect, County Offices, Preston. Deposit £2.

Oct. 7.—Stepney. Installation of electric lighting, heating and power at 145 flats and houses in Bancroft Rd. A. A. Hudson, Borough Engineer and Surveyor, Municipal Offices, Duval St., E.1. Deposit £5. (See Sept. 14 issue).

Oct. 9.—Dalkeith. Electrical work in 36 houses. Morham and Brotchie, Surveyors, 29 Hanover St., Edinburgh.

Oct. 9.—Dunbar T.C. Electrical work on 16 houses at Summerfield. S. W. Brown, Town Clerk, Town House, Dunbar.

Oct. 9.—Fylde (Lancs). Erection of 2 small electrically driven pumps for Water Board. H. Will Apted, Engineer to the Board.

Oct. 9.—Wakefield (Yorks) R.D.C. Electrical installation in 28 houses at Crigglestone, 20 at Sharlston, and 22 at Crofton. Engineer and Surveyor, Council Offices, 18 St. John's North, Wakefield.

Oct. 10.—Bristol T.C. Electrical work at the Crescent, Downend, and Downend Babies' Home. City Estates Surveyor and Valuer, The Exchange, Corn St., Bristol 1. Deposit £2 2s.

Oct. 10.—Galway. Electrical installations at Western Regional Sanatorium, Merlin Park. 4,650 medium voltage outlets for lighting, heating, cooking, etc., and 1,320 low voltage outlets for call systems, radio, clocks, etc. Secretary, Dept. of Health, Custom House, Dublin. Deposit £20.

Oct. 10.—Tamworth T.C. Wiring in welded screwed tube of part of Tamworth Castle. H. F. Bruce Smith, Borough Engineer and Surveyor, Municipal Offices.

Oct. 10.—Wortley R.D.C. Supply and erection of 50 standards and installation of street lighting at Grenoside. Engineer and Surveyor, Council Offices, Grenoside, Sheffield. Deposit £2 2s.

Oct. 11.—Bournemouth T.C. Supply and erection of vehicle-actuated traffic signs at Ashley Rd. Borough Engineer, Town Hall. Deposit £1 1s.

Oct. 12.—Blackpool T.C. Installation of electric lighting, heating, power, bells, etc., at Grange Park county primary school. Borough Surveyor, Municipal Bldgs. Deposit £2.

Oct. 13.—Belfast. Water screening plant of vertical rotating band type to deal with 2,880,000 gall./hr, for Harbour power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. (See Sept. 14 issue.)

Oct. 13.—Newcastle. Lighting and power installations at Montagu primary school. Applications to H. V. Lightfoot, Director of Education, City Education Office, Northumberland Rd., Newcastle 1. Deposit £5 5s. (Advertised in this issue.)

Oct. 13.—Sheffield T.C. Electrical installation to 16 police houses. Deposit £1. Also electrical installation at Acres Hill county primary school, for E.C. Deposit £2 2s. Separate tenders. W. George Davies, City Architect, Town Hall, Sheffield 1.

Oct. 14. — Ceiriog (Denbigh) R.D.C. Re-wiring of electric light and power points in 25 houses, Glyn Ceiriog. R. W. Aubrey, Surveyor, The Mount, Chirk. Deposit £1 1s.

Oct. 16.—Lisburn U.D.C. Supply of two 12½ h.p. electric motors with starters, vee belt drives, switchgear, and electrical installation at the waterworks, Pond Park. T. H. McDonald, Town Clerk, Town Hall. Deposit £2 2s.

Oct. 16.—Portstewart (Londonderry). Electrical installations in 52 houses. N. Ireland Housing Trust, 12 Hope Street, Belfast. Deposit 10s.

Oct. 16.—Swansea T.C. Electrical installation at Penlan primary school. Borough Architect, The Guildhall, Swansea. Deposit £2. (See Sept. 28 issue.)

Oct. 17.—Belfast. Electrical power and lighting installations, and all ancillary services including telephones, fire alarms and X-ray, also lift installations for N. Ireland Hospitals Authority. Secretary, 58 Howard Street, Belfast.

Oct. 18.—Metropolitan Water Board. Two sets of electrically driven well and surface pumps for Chingford Mill pumping station, Hall Lane, Chingford. Chief Engineer's Department (Room 235), Offices of the Board, New River Head, Rosebery Av., E.C.1. Deposit £1 1s.

Oct. 19.—Morley. Supply and installation of a sodium lighting scheme at Drighlington and Gildersome. Morley Hedley, Street Lighting Superintendent, Town Hall, Morley. Deposit 10s. 6d. (Advertised in this issue.)

Oct. 20.—Carlisle. Six vertical spindle motor-driven pumps and accessories, capacity 38 million gall per day. L. J. A. Stow, City Engineer and Surveyor, City Engineer's Office, Carlisle.

Oct. 21.—Bromsgrove R.D.C. Pumping plant at Belbroughton comprising 2 centrifugal pumps with motors, switchgear, valves, wiring, etc. Capacity, 65 galls. per min. Fiddian and Deeley, 13 Church Street, Stourbridge. Deposit £3 3s.

Oct. 21.—Saltcoats T.C. Electrical installation in 50 houses on New England site. Robert Rennie, architect, 33 Vernon Street, Saltcoats.

Oct. 23.—Shrewsbury T.C. Supply and erection of 56 precast reinforced columns 25ft high with wiring and fixing of lanterns with H.P.M.V. lamps and gear for Shrewsbury-Hereford (A49) Road. F. R. Dinnis, Borough Surveyor, The Guildhall, Shrewsbury. Deposit £2 2s.

Oct. 26—Birmingham. Electrical alterations to Field House, Clent. Herbert J. Manzoni, City Engineer and Surveyor, Civic Centre Birmingham 1. Deposit £2 2s.

Oct. 27.—Stirling C.C. Supply and erection of 22 concrete lamp columns including 145 yd of underground cable for street lighting on Langton housing scheme. Also erection of 63 steel lamp columns, brackets, lanterns, sodium vapour lamps, switches and laying of 580 yd of underground cable on A9 road in Laurieston and Polmont. Separate contracts. Thos. F. McGlashan, County District Sanitary Inspector, County Offices, Falkirk. (Both advertised in this issue.)

Oct. 28.—Sutherland T.C. Electrical work to a block of 2 houses and 2 garages. E. W. Brannen, Carnegie Buildings, Dornoch.

Oct. 30.—Manchester. Electrical installation at Newall Green infants' school, Wythenshawe. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

Nov. 6.—West Riding. Electrical installation in Goole Boothferry Rd. primary school. County Architect, Bishopgarth, Westfield Rd., Wakefield. Deposit £1 1s.

No date stated.—Arklow, Co. Wicklow. Electrical work for cold room installation at Countess of Wicklow Memorial Hospital. Form of tender from secretary.

No date stated.—Banff. Lighting of Tomintone Main Street. C. G. Taylor, area officer, 67 Moss Street, Keith.

No date stated.—Castle Ward (Northumberland). Conversion of 94 houses from gas to electric lighting at Hazlerigg. G. E. Dimmack, Surveyor, 7 North Rd., Ponteland.

No date stated.—Carlisle T.C. Electrical installation in 128 houses. City Engineer, 18 Fisher Street.

No date stated.—Kilrenny T.C. Electrical works in erection of 26 houses at Glebe site, Anstruther Weston. A. D. Haxton and Watson, Architects, Leven.

OVERSEAS

Details of items marked • may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.

Oct. 10.—Mozambique. Two diesel generators each of 150 kW 380-220 V. Permanent Purchasing Commission, Mozambique Treasury Dept., Laurenco Marques. B.o.T. (Ref. CRE (IB) 65151/50).•

Oct. 10.—Uruguay. 24 vertical and 9 horizontal centrifugal electric pumps; magnetic starters, circuit breakers, voltmeters, power factor, frequency meters, ammeters, wattmeters and transformers; cables, cable boxes, conduit; valves and flanges; pressure and vacuum gauges. Ministerio de Obras Publicas (Direcion de Saneamiento). B.o.T. (Ref.: CRE (IB) 65159/50)•.

Nov. 13.—Johannesburg. One 300 kVA and one 100 kVA transformer suitable for 11kV/400/230 V. Town Clerk, Hermanus. Deposit 10s. 6d.

Oct. 14.—Pakistan. Diesel-driven centrifugal pumping sets capable of delivery of 4,000 galls per hour, for Dept. of Supply and Development, Frere Rd., Karachi. B.o.T. (Ref. CRE (IB) 64930/50).•

Oct. 24.—Persia. Two generators, two each diesel power units, 250 kW, 294 kVA, 2,300 V with low piston speed heat exchangers. Dr. Massoud Maleki, Economy and Purchase Dept., Rue Amireh, Shahpur Ave., Tehran. B.o.T. (Ref. CRE (IB) 63961/50).•

Oct. 24.—Wellington (N.Z.) 250 miles of cadmium copper wire. Director-General (Stores Division), G.P.O., Wellington C.1.

Oct. 25.—Queensland. L.t. pin-type and shackle insulators, medium and h.t. pin-type and shackle insulators, guy strain and disc type insulators, and metal fittings for disc insulator. Secretary, State Electricity Commission, Scottish Union House, Eagle St., Brisbane.

Oct. 25.—Queensland. 560,000 yd of hard drawn copper cable of various sizes for Cairns Regional Electricity Board. State Electricity Commission, Scottish Union House, Eagle St., Brisbane. B.o.T. (Ref. CRE (IB) 64902/50).•

Nov. 1.—Queensland. Copper jointing sleeves, switchgear, fuses and lighting arresters, line construction material for Townsville Regional Electricity Board. State Electricity Commission of Queensland.

Nov. 4.—Egyptian Govt. One 25,000 kW turbo-generator (or two units totalling the same power) and two boiler units complete with auxiliary switchgear and transformer, for Cairo North station. Chief inspecting engineer, Egyptian Government, 41 Tothill Street, London S.W.1. Fee £25 12s. 6d.

Your Queries — Answered

"S.R." motor starters, makers of? T.B.—Solenoid Regulator Co., 268 Moseley Rd., Birmingham. (18809)

"Marris" kettle, makers of? M.I.—Marris's Ltd., Cumberland St., Birmingham 1. (18803)

Hamilton Gibbs Co., address of? N.E.—This firm were at 13A, Barnsbury Sq., London N.1., in 1940, but we can no longer trace them. (18812)

J.P. Hall Motors, address of? W.O.—Hall Motor Repairs Ltd., of Blacksiding Works, Werneth, Oldham, can supply spares. (18765)

"Kingshome" kettles, makers of? T.E.—Kee Radio & Elec. Equipment Co., King's Road, High Wycombe. (18817)

"Neora" cold cathode lighting equipment, makers of? A.W.—Neon Rentals Ltd., 168 Victoria St., S.W.1. (18822)

"Speeko" shavers, agents for? T.E.—Thompson and Capper Wholesale Ltd., Speke Hall Road, Liverpool 19. (18824)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWERS WANTED

"C.G.B." white metal bearings, makers of? R.O. (18829)

"Clockra" motor starters, makers of? T.E. (18833)

Nov. 6.—S. Rhodesia. Eight transformers between 1,000 and 5,000 kVA for Electricity Supply Commission. Secretary, P.O. Box 377, Salisbury. B.o.T. (Ref. CRE (IB) 64994/50).*

Nov. 21.—Australia. Television equipment comprising transmitter, electron tubes, radiating system, intercommunication equipment, radio link and outside broadcast equipment, sound reproducing and recording equipment, programme monitors, studio lighting and testing and measuring equipment for Deputy Director, Posts and Telegraphs, Melbourne, C.1. Supply Branch, Room 406, Australia House, Strand, W.C.2.

Nov. 28.—Melbourne. Three steam generators for Dept. of Public Works, Melbourne. B.o.T. (Ref. CRE (IB) 65170/50).*

Dec. 1.—Tangier. Electrical materials for re-fitting and expansion of Mogago Power Station which will be a 5,750 V installation. Also electrical materials for refitting and extension of Mogoga 5,750/22,000 step-up station. Director, Regie des Services de L'Eau et de L'Electric de la Zone de Tanger, Rue Vermeer, Tangier.

Dec. 6.—Queensland. Erection of 66 kV transmission line between Maryborough and Kingaroy, for South Burnett Regional Electricity Board. B.o.T. (Ref. C.R.E. (IB) 65517/50)*.

Dec. 13.—Queensland. Switchgear, relays and carrier current equipment for Tully Falls. State Electricity Commission on behalf of Cairns Regional Electricity Board.

Jan. 30.—Wellington (N.Z.). 11 kV switchgear, 250 MVA, 11,000V, comprising 9 panels of switchgear, one switch-handling truck, one outdoor current transformer, for Kinleith substation. B.o.T. (Ref. C.R.E. (IB) 65595/50)*.

TRADE NOTES

Change of Address.—T. T. Young and Co., 77-81 Rose St., Edinburgh, have moved their Kirkcaldy branch from 27 Kirk Wynd, to larger premises at 282-284 High St. The telephone number is Kirkcaldy 3831.

Sale of Business.—The business of Brown and Young, electricians of 7a Bath St., Glasgow, was closed down as from September 16 and sold to John Irving and Sons of 82 Victoria Rd., Glasgow, who will carry on the business as before.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday evening)

	£ s. d.	New York price
COPPER, electrolytic	202 0 0	£196 0 0
Delivered in 2nd and 3rd month after order	215 10 0	—
Delivered in 4th, 5th and 6th month after order	217 0 0	—
LEAD, good soft pig (foreign)	128 0 0	125 0 0
" " " " "English" quality	129 10 0	—
Delivered in 2nd and 3rd month after order, plus	7 0 0	—
TIN (99-99.75%) (Cash)	820-824	—
(3 months)	804-805	—
ALUMINIUM, commercial purity (del.)	112 0 0	—
ZINC	151 0 0	190 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	45 10 0	—
Mild Steel Tape (0.04 in.)	26 0 0	—

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Magnafeed. 689,729. Class 7. Automatic separating machines. Magnetic Separators Ltd., 2/4 Grimshaw St., Bootle, Liverpool 20.

Linvar. 687,690. Class 9. Variometers, induction regulators, and electro-magnetic apparatus (not for medical or surgical purposes). Muirhead and Co. Ltd., Croydon Rd., Elmers End, Beckenham, Kent.

Lotus. 688,882. Class 9. Electricall appliances being parts of electrical wiring installations for use in the controlling of electrical discharge lighting apparatus. 688,883. Class 11. Electrical discharge lighting apparatus and fittings. Thorn Electrical Industries Ltd., 105/109 Judd St., London W.C.1.

Parlite. 689,760. Class 9. Electric flat irons. Conrad Parlanti Castings, The Foundry, Herne Bay.

CONTRACTS PLACED

Bradford T.C. Electrical lift in Council's premises at Darley Street. Evans Lifts Ltd., £1,198. Also electrical installation in 160 houses and 20 flats on Buttershaw Estate. T. D. Long, £4,068.

B.E.A. Roosecote power station, Barrow-in-Furness: Condensing and feed heating plants for two 30,000 kW sets, Vickers-Armstrongs Ltd.; 132 kV transformers Metropolitan Vickers Electrical Co. Ltd.. Bold power station, (St. Helens), and Fleetwood power station, Condensing, feed heating and de-aerating plant for three 30,000 kW sets, Vickers-Armstrongs Ltd.; Carmarthen Bay power station, 132 kV 2,500 MVA switchgear, Ferguson, Pailin Ltd.; Stoke-on-Trent: 132 kV overhead line, British Insulated Callender's Construction Co. Ltd.

Grimsby T.C. Electrical installations to 174 houses at Nunsthorpe. Hobson and Scott Ltd., £5,196, and further 92 houses. T. Dickinson & Son, £2,563.

Newcastle. Electrical installation at Hilton primary school. C.W.S. Ltd., £15,260.

GAZETTE ANNOUNCEMENTS

COMPANY ACTS

Lancashire Electro Plating Co. Ltd. Meeting of creditors at H. J. Davidson and Co., Mynshull's House, 14 Cateaton St., Manchester 3, on Oct. 11, at 2 p.m.

Appointment of Liquidator

Welwyn Garden City. Welwyn Electricity Installations Ltd. has appointed John Frederick Eccles, The Gables, Red Rd., Boreham Wood, Herts., as liquidator.

Lowestoft. E. J. Pike (Radio Acoustics) Ltd., 172 High St., Lowestoft, B. Walker, chartered accountant, 63 London Rd. North Lowestoft and E. W. Freeman, Incorp. accountant, 22 London Rd. North, have been appointed liquidators.

Partnership Dissolved

Baslow (Derby). Kenneth Montague Musgrave and David Edward Palmer, trading as Musgrave and Palmer, radio and electrical engineers, at The Mill, Baslow. Partnership dissolved as from Sept. 22.

BANKRUPTCY ACTS

Receiving Orders

Brighton. M. R. Balsden, radio engineer of 43 Brunswick St., West Hove. Date of receiving order Sept. 22.

Salisbury. James Stewart Anderson, trading as "Electronic Services", at Nearavon, Salisbury St., Fording Bridge. Date of receiving order, Sept. 26.

BUSINESS PROSPECTS

HOME

Barrow-in-Furness T.C. Erection of 164 houses on Newbarns estate. J. N. Flitcroft, Town Hall.

Bedfordshire. Erection of county junior school at Leighton Buzzard for E.C. County Architect, Shire Hall, Bedford.

Berkshire C.C. Erection of primary school at Cumnor. County Architect, Wilton House, Parkside Rd., Reading.

Boldon U.D.C. Erection of 146 houses on Lizard Lane site.

Brackley (Northants) R.D.C. Erection of 6 houses and 1 bungalow at Charlton and 7 houses at Greatworth. G. Forsyth Lawson and A. Cyril Cheek, 30 Horse Fair, Banbury, Oxon.

Bradford. T.C. recommended to invite tenders for erection of 20 houses at Harrogate Rd., approved lay-out of land on same site for 30 houses, and lay-out has been approved for 2,700 houses in the city.

Buxton T.C. Erection of 32 houses on various sites. A. C. W. Ryland, Borough Engineer, Town Hall.

Carlisle T.C. Plans have been prepared for electrical installation in 128 houses. No contracts let.

Chapel-en-le-Frith R.D.C. Erection of 15 houses at Charlesworth. Pendleton and Dickinson, Architects, 16 Brazennose St., Manchester 2.

Chesterton (Cambs.) R.D.C. Erection of 20 houses at Harston and 8 at Graveley. H. Jackson, Architect, 93, Hartington Grove, Cambridge.

Cobh (Cork) U.D.C. Erection of 52 houses at Newtown. Town Hall, Cobh.

Corby. U.D.C. to buy 500 refrigerators for hire to council tenants.

Cork (Eire) C.C. Erection of 42 houses at Michelstown, 20 each at Castlelyons and Clondulane, 14 at Boherbue, 12 each at Dromina and Millstreet, 8 each at Ballyclough and Lombardstown, 4 at Rockmills and 2 at Bartlemy. Separate contracts. Secretary, Cork C.C., Shortcastle, Mallow.

Cumberland C.C. Erection of primary school at Whitehaven. John H. Haughan, County Architect, 15 Portland Sq., Carlisle.

Dartford. Erection of 24 flats and 8 houses on Temple Hill estate. T. Armstrong, Town Clerk, Town Clerk's Office, Dartford.

East Suffolk. Erection of primary school at Ringshall for C.C. County Architect, E. J. Symcox, County Hall, Ipswich.

Edinburgh T.C. Alterations at Victoria Park House to form day nursery. City Architect, City Chambers, Edinburgh.

Epping U.D.C. Erection of 14 houses at Beaconfield estate. B. Hiscott, Clerk of the Council, 91 High St., Epping.

Erith T.C. Erection of 66 flats and 6 shops with 18 flats on Lesney Farm estate. A. J. H. Sprague, Quantity Surveyors, 72 New Cavendish St., London W.1.

Evesham. Erection of 76 houses on Fairfield estate has been approved.

Great Harwood U.D.C. Construction of 30 houses and 6 old people's dwellings at Waverledge estate. Engineer and Surveyor, Town Hall.

Guildford T.C. Plans approved for installation of 64 electrical storage heaters in Council houses.

Harrow U.D.C. Erection of 12 houses at Elstree. Engineer and Surveyor, Council Offices, Uxbridge Rd., Stanmore.

Hawes, Middlesbrough. Work expected to begin in spring on factory for Wensleydale Dairy Products (Hawes) Ltd., at estimated cost of £30,000.

Lincoln. Erection of Hartsholme infants' school for E.C. A. Sutcliffe, City Education Office, 4 Lindum Rd., Lincoln.

Lindsey. Erection of junior school at Horncastle for C.C. County Architect, County Offices, Lincoln.

Motherwell and Wishaw (Lanark) T.C. Dean of Guild Court has approved erection of 524 houses at Wishaw Hill at estimated cost of £1 million.

Newbury (Berks.). R.D.C. propose to erect 30 houses at Love Lane, 12 at Chieveley, 9 at Brimpton, 6 at Thatcham, and 4 each at New Rd., Midgham and Woolhampton.

Portsmouth T.C. Erection of 56 flats at Nelson Rd. A. E. Cogswell and Sons, Architects, Prudential Buildings, Portsmouth.

Runcorn U.D.C. Erection of 45 houses on Town Hall estate. A. B. Cunningham, Engineer and Surveyor, Town Hall, Runcorn.

Sheffield T.C. Approval received for erection of 29 shops at Manor Park, 14 at Stradbroke, 9 at Littledale, 8 at Ballifield Hall, 6 at Woodthorpe extension and 5 at Richmond.

Smethwick T.C. Erection of 28 houses at Oldbury. D. M. Waite, Borough Engineer and Surveyor, Council House.

Somerset C.C. Erection of infants' school at Wells, at estimated cost of £12,000. R. O. Harris, County Architect, Park St., Taunton.

Staffordshire C.C. Erection of county primary school at Ocker Hill, Tipton. A. C. H. Stillman, Architect and Surveyor, Green Hall, Lichfield Rd., Stafford.

Staythorpe, Newark. B.E.A. has received consent for development of power station, including installation of 60,000 kW turbo-alternator.

West Hartlepool. Plans approved for county primary school at Owton Manor.

West Riding. Erection of primary schools at Rossington, Conisbrough, Elland and Wath Park Rd., also extensions to mining and technical institutes at Castleford, Whitwood and Dinnington. County Archtect, Bishopgarth, Westfield Rd., Wakefield.

Weymouth T.C. Erection of 78 houses on Downclose estate. Contracts for a further 200 houses will shortly be advertised. Borough Engineer and Surveyor, 6 Pulteney Bldgs., Weymouth.

Wisbech T.C. Proposes to erect 62 houses near Barton Rd., and 250 at Norwich Rd. site.

OVERSEAS

Canada. Television components for stations planned to be operating in Montreal and Toronto in a year or so. Interested manufacturers who are represented in Canada should contact E. J. McWilliams, Assistant Director, Emergency Import Control Branch, Dept. of Trade and Commerce, Ottawa.

U.S.A. Harding Devices Co., 4412 East Lovers Lane, Dallas 5, want 6,000 of 270 ohms resistors and 3,000 of 330 ohms resistors of ½ W. 2,000 of former and 1,000 of latter required immediately.

MEETINGS TO NOTE

THURSDAY, OCT. 5

I.E.E. (London).—President's Address. Sir Archibald Gill. Savoy Place.—5.30 p.m.

COMBUSTION ENGINEERING ASSN.—Two-day Conference at Palace Hotel, Buxton.

I.E.S. (Cardiff Centre).—"Church and Chapel Lighting." L. C. Rettig. S. Wales Elect. Board, The Hayes.—5.45 p.m.

I.E.S. (Exeter Group).—"Modern Methods of Illumination." C. W. Rawlings. Agricultural House, Queen St.—7 p.m.

BRIT. INSTN. OF RADIO ENGNRS. (N.W. Section).—"Education in Industry." Dr. P. F. R. Venables. College of Technology, Manchester.—6.45 p.m.

I.E.E. (Cardiff Students Section).—Chairman's address. T. Thomas. Park Hotel, 6.30 p.m.

FRIDAY, OCT. 6

ELECT. TRADES' COMM. TRAVELLERS ASSOC.—Annual dinner-dance at Cafe Royal, Regent St., W.1.

I.E.S. (Bath and Bristol Centre).—"Light, Colour and the Stage." E. E. Faraday. Provident Hall, Prewett St., Bristol.

I.E.S. (Birmingham Centre).—Chairman's Address. F. Penson. Imperial Hotel, Temple St.—6 p.m.

I.E.S. (Leeds Centre).—Chairman's Address. J. W. Howell. Guildford Hotel, The Headrow.

I.E.S. (Huddersfield Group).—"Fluorescent Lighting in the Hospital." J. K. Frisby. Elect. Showrooms, Market St.—7.15 p.m.

MANCHESTER ASSOC. OF ENGRS.—President's address. J. Adamson. Engineers' Club, Albert Sq., 6.45 p.m.

ENGR. SURVEYORS' ASSOC. (London Branch) "Fluorescent Lamps." C. R. Bicknell of Siemens Ltd. Lighting Service Bureau, 2 Savoy Hill, W.C.2., 6.30 p.m.

SOC. OF INSTRUMENT TECHNOLOGY (Scottish Centre) "Valve Characteristics." B. R. Jones. R.T.C., 3 p.m.

MONDAY, OCT. 9

INCORP. PLANT ENGNRS (Dundee Branch).—"Industrial Heating and Choosing the System." H. W. L. Tuckey. Mathers Hotel.—7.30 p.m.

I.E.E. (S. Midlands Centre).—Chairman's Address and Annual Meeting. D. H. Kendon. Grand Hotel.—6 p.m.

I.E.E. (N.E. Centre).—Chairman's Address. P. J. Ryle. Neville Hall, Westgate Rd., Newcastle.—6.15 p.m.

I.E.E. (Norwich District).—"Development and Design of Electrical Control Gear for Machine Tools." A. R. H. Thorne.—7.30 p.m.

I.E.E. (London Students' Section).—Chairman's Address. "Television—An Introduction to the Generation and Transmission of Television Signals."

I.E.E. (Western Centre).—Chairman's Address. G. D. Arden. S. Wales Inst. of Engnrs., Park Place, Cardiff.—6 p.m.

TUESDAY, OCT. 10

I.E.S.—Presidential Address. L. J. Davies. Royal Soc. of Arts, John Adam St., London W.C.2.—6 p.m.

I.E.S. (Liverpool Centre).—Chairman's Address. T. D. Woods. The Temple, Dale St., Liverpool.—6 p.m.

I.E.S. (Stoke-on-Trent Group).—"Floodlighting." M. W. Peirce. 31 Kingsway.—6 p.m.

I.E.E. (London Measurements Section). — Chairman's Address. G. A. V. Sowter. Savoy Place.—5.30 p.m.

I.E.E. (N.W. Centre).—Chairman's Address. H. G. Bell. Engineers' Club, Albert Sq., Manchester.—6.30 p.m.

I.E.E. (N. Ireland Centre).—Chairman's Address. R. P. Watson. Queen's Univ., Belfast.—6.45 p.m.

I.E.E. (Scottish Centre).—Chairman's Address. J. Henderson. 39 Elmbank Crescent, Glasgow.—7 p.m.

ASSOC. OF MINING ELECT. AND MECH. ENGRS. (W. Scotland Branch).—Presidential address. J. McOnat. R.T.C., 6.45 p.m.

A.S.E.E. (S.W. London Branch). "High Rupturing Capacity Fuse." E. F. Britton. Compton Hall, Compton Road, Wimbledon. 8.15 p.m.

WEDNESDAY, OCT. 11

I.E.S. (Edinburgh Centre).—"Coloured and Directional Light as Applied to the Stage." L. G. Applebee. Lighting and Cleansing Dept., High St.—7 p.m.

I.E.E. (S. Mid. Students' Section).—Chairman's Address. R. S. Atkins. Jas. Watt Memorial Inst.

INCORP. PLANT ENGNRS (E. Mid. Branch).—"Instruments in General Use in Engineering." Dr. E. W. R. Little. Welbeck Hotel, Nottingham.—7 p.m.

I.E.E. (Southern Centre).—"The Design and Operation of a 30 MeV Synchrotron." D. W. Fry, J. Dain, H. H. H. Watson, and H. E. Payne. R.A.E. Tech. College, Farnborough.—7.30 p.m.

BRIT. INSTN. OF RADIO ENGNRS. (N.E. Section).—"High Fidelity Reproduction." H. J. Leake. Neville Hall, Westgate Rd., Newcastle.—6 p.m.

I.E.E. (Oxford District).—"Present Problems in Television." G. H. Watson. Elect. Showrooms, 37 George St.—7 p.m.

I.E.E. (Scottish Centre).—Chairman's Address. J. Henderson. Heriot-Watt College, Edinburgh.—7 p.m.

I.E.E. (N.E. Scotland Sub-Centre).—Chairman's Address. E. Wilkinson. Caledonian Hotel, Aberdeen.—8 p.m.

I.E.E. (S.W. Sub-Centre).—Chairman's Address. L. V. Turner. Elect. House, Taunton.—3 p.m.

MANCHESTER ASSOC. OF ENGRS. (Students' Section). — Chairman's Address. A. Kiesnan. Engrs.' Club, Albert Sq., 7 p.m.

INST. OF HEATING AND VENTILATING ENGRS. "Design and Manufacture of Steel Tubes." J. S. Blair. Storeys Gate, S.W.1., 6 p.m.

A.S.E.E. (Birmingham Branch) "Electrical Installation." J. Flood. Chamber of Commerce, New St., 7 p.m.

A.S.E.E. (Bradford Branch). "Industrial Switchgear Installations." A. T. Crawford. Midland Hotel, 7.30 p.m.

THURSDAY, OCT. 12

DUNFERMLINE ELECT. SOC.—"Cable Fault Location." H. Walton. Unitas Hall, Queen Anne St.—7 p.m.

I.E.S. (Glasgow Centre).—"Coloured and Directional Light as Applied to the Stage." L. G. Applebee. 39 Elmbank Crescent.—6 p.m.

I.E.S. (Leicester Centre).—Presidential Address. L. J. Davies. E. Mid. Elect. Board, Charles St.—6.30 p.m.

I.E.S. (Manchester Centre).—"Recent Advances in Ophthalmology." D. L. Charters. Town Hall Extension.—6 p.m.

I.E.E. (Rugby Students' Section).—Chairman's Address. D. Bolton. E.M.E.B., Little Church St.—6.30 p.m.

INSTN. OF WORKS MANAGERS (Wembley Sub-Branch). — "Some Aspects of Works and Sales Co-operation." J. G. Christopher of G.E.C. Ltd. The Plough, Kenton Rd., Kenton.—12.30 p.m.

I.E.E. (London Utilization Section).—Chairman's Address. A. N. Irens. Savoy Place.—5.30 p.m.

I.E.E. (N. Midland Centre).—Chairman's Address. W. F. Smith. District meeting at Ferensway, Hull.—7.30 p.m.

I.E.E. (N.E. Scotland Sub-Centre).—Chairman's Address. E. Wilkinson. Royal Hotel, Union St., Dundee.—7 p.m.

I.E.E. (W. Wales Swansea Sub-Centre).—Chairman's Address. J. Parker. Plaza Cinema.—6 p.m.

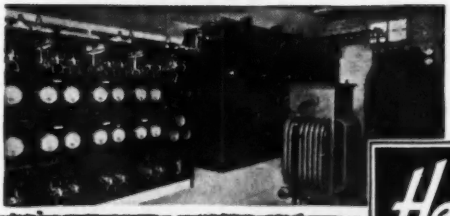
NEW COMPANIES

Bailey, Stamp and Sons, Ltd., 38 Green Lane, Northwood, Mdx. Cy. on bus. of light, mech., elec., automobile, aeronautical and genl. engrs., etc. Nom. cap.: £2,500 in £1 shs. Permt. dirs.: L. S. Bailey and T. R. Stamp, 26 Green Place, Crayford, Kent.

K. W. Balfour and R. H. Chamberlain, Ltd., 1 Fenchurch Bldgs., Fenchurch St., E.C.3. Cy. on bus. of consulting, refrigerating and elec. engrs., etc. Nom. cap.: £1,000 in £1 shs. Dirs.: K. W. Balfour and R. H. Chamberlain.

H. A. Trading Co., Ltd., 18 Maddox St., W.1. Cy. on bus. of mnfrs., importers and exporters of and dlrs. in mech. and elec. engrs.' plant, etc. Nom. cap.: £100 in £1 shs. Dirs.: J. K. Haynes and Joan L. M. Haynes.

Complete RECTIFIER SUBSTATION EQUIPMENTS comprising



A complete Hewittic substation feeding a light and power network in the London area. Equipment illustrated includes an induction regulator for voltage control, main transformer and D.C. switchgear.

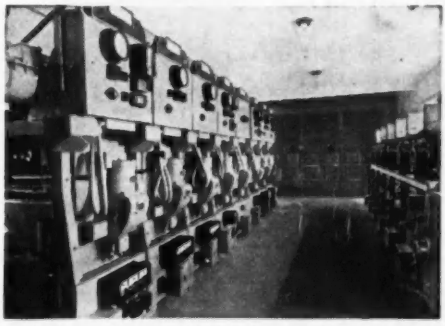
Hewittic Rectifiers

REGD. TRADE MARK

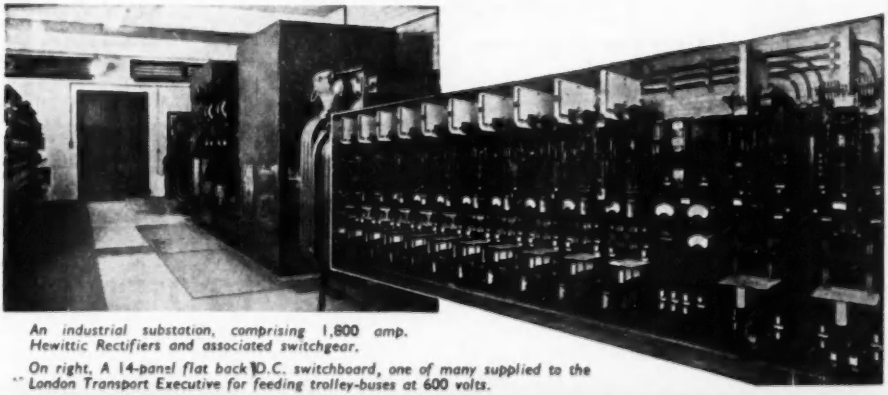
and associated switchgear

Hackbridge and Hewittic Electric Co., Ltd., have supplied complete equipment for a very large number of rectifier substations, including in each case not only the Hewittic Rectifier—simplest, most reliable of all converting plant—but also the whole of the H.V. and L.V. switchgear.

The Company will gladly offer its advice and quotation for complete equipment, with the assurance—from long experience—of a thoroughly satisfactory installation, modern in lay-out and efficient and trouble-free in operation.



A substation on the Midland Region of British Railways, with Hewittic Rectifier (centre), H.V. switchboard (left) and high-speed D.C. switchgear (right)—all supplied by Hackbridge and Hewittic Electric Co., Ltd.



An industrial substation, comprising 1,800 amp. Hewittic Rectifiers and associated switchgear.

On right, A 14-panel flat back D.C. switchboard, one of many supplied to the London Transport Executive for feeding trolley-buses at 600 volts.

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

COUNTY COUNCIL OF STIRLING

South Eastern District

STREET LIGHTING
LANGTON HOUSING SCHEME, LAURIESTON, SECOND AND THIRD DEVELOPMENT

TENDERS are invited for the installation of street lighting for the above housing scheme.

The work includes the supply and erection of 22 concrete lamp columns, including the provision of 145 yds. underground cable.

Specification and form of tender may be obtained from Mr. Thos. F. McGlashan, County District Sanitary Inspector, County Offices, Falkirk, at whose office plans may be seen.

Sealed tenders, endorsed "Street Lighting, Langton 2nd and 3rd Development," should be lodged with the undersigned not later than 12 noon on 27th October, 1950.

JAMES D. KENNEDY,
County Clerk.

Viewforth, Stirling. (G 262)

COUNTY COUNCIL OF STIRLING

South Eastern District

LONDON - EDINBURGH - THURSO TRUNK ROAD A9
LAURIESTON AND POLMONT LIGHTING

TENDERS are invited for the complete installation of Street Lighting in Lauriestoa and Polmont on approximately 2,504 lineal yards of the above road.

The work includes the supply and erection of 63 steel lamp columns, brackets, lanterns, sodium vapour lamps, switches and also laying approximately 580 yards underground cable.

Specification and Form of Tender may be obtained from Mr. Thos. F. McGlashan, County District Sanitary Inspector, County Offices, Falkirk, at whose office plans may be seen.

Sealed tenders, endorsed "Lauriestoa and Polmont Lighting," should be lodged with the undersigned not later than 12 noon on October 27th, 1950.

JAMES D. KENNEDY,
County Clerk.

Viewforth, Stirling. (G 263)

CITY AND COUNTY OF NEWCASTLE-UPON-TYNE EDUCATION COMMITTEE

Montagu Primary School

TENDERS are invited from reputable electrical contractors for the electric lighting and power installation in the above school. Firms wishing to tender should apply for particulars before noon on Friday, October 13, enclosing (1) a deposit of 5 gns., which will be refunded on receipt of a bona fide tender, and (2) evidence that an electrical contract exceeding £5,000 in value in a public or commercial building has been carried out satisfactorily by the contractor during the last five years.

Plans and specifications prepared by the Department's Consulting Engineers, Messrs. R. W. Gregory and Partners, will be issued to suitable applicants not later than October 17, and tenders are to be returned not later than first post on November 4, 1950.

The Education Committee do not bind themselves to accept the lowest or any tender.

H. V. LIGHTFOOT,
Director of Education.

City Education Office,
Northumberland Road,
Newcastle-upon-Tyne 1. (G 287)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

COUNTY BOROUGH OF SWANSEA

Penlan Primary School, Penlan, Swansea

TENDERS FOR ELECTRICAL INSTALLATION

FIRMS wishing to tender for the Electrical Installation at Penlan Primary School, now in course of erection at Penlan, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before October 16, 1950.

Plans, specifications and conditions of contract can be obtained on application and deposit of £2, provided the applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona fide tender (which is not subsequently withdrawn), and the return of all documents.

No guarantee is given that the lowest or any other tender will be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall, Swansea. (G 198)

BOROUGH OF MORLEY

EXTENSION OF SODIUM LIGHTING ON ROUTE A650

TENDERS are invited for the supply and installation of a sodium lighting scheme at Drighlington and Gildersome in the Borough of Morley.

Conditions and forms of tender, upon payment of a deposit of 10·6 which will be refunded after the receipt of a bona fide tender, will be supplied by Mr. Morley Hedley, Street Lighting Superintendent, Town Hall, Morley, to whom completed forms should be returned not later than 9 a.m., Thursday, October 19, 1950.

E. V. FINNIGAN,
Town Clerk.
(G 242)

APPOINTMENTS VACANT

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited from suitably qualified candidates for the appointment of SECOND ASSISTANT ENGINEER (Electrical) in the Generation (Construction) Department, which is situated at Agecroft Generating Station, Pendlebury, near Manchester.

Candidates should have wide experience in design, layout, and installation of the electrical plant associated with modern generating stations. Experience of station operation and in a large manufacturer's works is desirable.

The salary for the post, which is superannuable, will be in accordance with Grade 2, Schedule "C," of the Revised N.J.B. Agreement, i.e., £752 to £966 per annum.

Applications, stating age, qualifications and experience, should be received by The Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than October 14, 1950. (G 289)

MIDDLESEX COUNTY COUNCIL

County Architect's Department

ELECTRICAL ENGINEERING ASSISTANT required; commencing salary, if 26 years or over, APT.V (£550x£15(2)x£20(1) to £800 per annum). Established and pensionable subject to medical fitness. Applicants should be experienced in electric lighting, power, lift and refrigerator installations in large public buildings, and able to write specifications, reports, etc. Application forms from County Architect, 10 Gt. George Street, S.W.1 (stamped addressed foolscap envelope), returnable by October 14, 1950 (quoting H.596 E.T.). Canvassing disqualifies. (G 246)

CROWN AGENTS FOR THE COLONIES

ENGINEERS required by the Central Electricity Board, Federation of Malaya, for three years, with prospect of permanency. Salary (including Expatriation Pay), payable in local currency, equivalent at the present Government rate of exchange to £742 a year, rising to £1,652 a year. Commencing salary according to age and experience. Cost of living allowance equivalent to between £210 and £525 a year, according to salary and dependants. Free passages. Liberal leave on full salary. Candidates, between 24 and 35 years of age, must have had a good general education and be qualified for one of the following posts:

(*a*) M.N.25450/3B) MECHANICAL ENGINEER. Candidates must be corporate members or graduates of the Institution of Mechanical Engineers, or possess equivalent qualifications, and have had sound training in mechanical engineering, with experience in the installation and maintenance of all mechanical equipment in large modern thermal power stations. Experience in Parsons turbines and Babcock and Wilcox boilers a distinct advantage.

(*b*) M.N.25728/3B) ELECTRICAL ENGINEER (HYDRO-ELECTRIC). Candidates must be corporate members or graduates of the Institution of Electrical Engineers (or the equivalent), and have had sound training in both electrical and mechanical engineering, with experience in the operation of medium electricity supply undertakings. They should possess a competent knowledge of the erection and maintenance of high and low tension overhead and underground a.c. distribution systems and sub-station plant. Experience in maintenance and operation of diesel engines a distinct advantage. Preference will be given to candidates with experience of hydro-electric construction.

Apply at once by letter, stating age, full name in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting for (*a*) M.N.25450/3B, for (*b*) M.N.25728/3B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications, and will communicate only with applicants selected for further consideration.

(G 247)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER in the COMMERCIAL DEPARTMENT at AREA BOARD HEADQUARTERS.

Applicants should have had a sound technical and general education and experience in the commercial activities of an electricity supply undertaking. A knowledge of statistical theory and consumer research will be an advantage. The salary will be in accordance with the National Joint Board Revised Agreement, Grade 5, Class "AX BX," and will commence at a point within the range of £579 to £731 per annum, depending upon qualifications and experience. The appointment is superannuable.

The duties will include compilation and analysis of statistical data, technical costing analysis, and preparation of data for tariff purposes.

Applications, giving full details of training, qualifications, experience, age, present appointment and salary, and stating whether married or single, should be submitted to the Chief Commercial Officer, South East Scotland Electricity Board, 52 Melville Street, Edinburgh, within 14 days.

THOMAS J. MULLAN,
Secretary.

(G 286)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the following appointments at salaries in accordance with the Revised National Joint Board Agreement:

(1) COMBUSTION AND EFFICIENCY ENGINEER, Tir John Power Station, Swansea. Class "G," Grade 7 (£651 to £679 per annum).

(2) COMBUSTION AND EFFICIENCY ENGINEER, Llynfi Power Station, Aberkenfig. Class "F," Grade 7 (£625 to £643 per annum).

When the present extensions have been completed at this station the salary will be increased to Class "G," Grade 7 (£651 to £679 per annum).

The above salaries are provisional and subject to negotiation through the National Joint Board.

Applicants should preferably have served a regular apprenticeship, obtained the Higher National Certificate, and had previous experience with large pulverised fuel boilers and Bailey automatic combustion control.

The appointments will be superannuable under the British Electricity Authority and Area Boards Scheme.

Forms of application may be obtained from the Divisional Secretary at the address below, to whom completed applications should be returned not later than October 20, 1950, in sealed envelope endorsed with the appointment sought.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport,
Cardiff.
September 27, 1950.

(G 291)

NORTH WESTERN ELECTRICITY BOARD

No. 2 Sub-Area

APPOINTMENTS—SUB-AREA CONSUMERS' ENGINEER'S DEPARTMENT

APPLICATIONS are invited for the following appointments in the Sub-Area Consumers' Engineer's Department, No. 2 Sub-Area Headquarters, Bolton.

(1) SECOND ASSISTANT ENGINEER—Power Sales.

Applicants should have experience in the utilisation of electricity in industry with particular reference to the Textile, Colliery and Engineering trades, the economics of private generating plant, change-over from d.c. to a.c., and development of industrial and street lighting.

Corporate membership of the Institution of Electrical Engineers will be an advantage.

The salary will be in accordance with the National Joint Board Revised Schedule, Class "L," Grade 7, i.e., £841/861/881 per annum.

(2) THIRD ASSISTANT ENGINEER—Power Sales.

Applicants should have experience in the utilisation of electricity in industry, preferably with reference to the Textile, Colliery and Engineering trades, change-over work from d.c. to a.c., the economics of private generating plants, industrial and street lighting.

Technical training up to Higher National Certificate standard will be an advantage.

The salary will be in accordance with the National Joint Board Revised Schedule, Class "L," Grade 10, i.e., £687/700/713 per annum.

(3) SECOND ASSISTANT ENGINEER—Domestic and Commercial Sales and Development.

Applicants should have experience in connection with the following :—

Domestic and commercial sales, including hire and hire purchase.
Domestic and commercial sales development.
Agricultural and horticultural applications of electricity.
Organisation of exhibitions and demonstrations.
Publicity and display.
Supervision of service centres.

The salary will be in accordance with the National Joint Board Revised Schedule, Class "L," Grade 7, i.e., £841/861/881 per annum.

(4) GENERAL ASSISTANT ENGINEERS (Installation Contracts).

Applicants should have experience in the supervision of the installation of wiring, switchgear, motors, plant and lighting in industrial and commercial premises and public buildings.

The salaries will be in accordance with the National Joint Board Revised Schedule, Class "L," Grade 13, i.e., £547/561/575 per annum.

All the above posts are superannuable.

Applications stating age, experience, qualifications, present post and salary, should be received by the Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, not later than Saturday, 21st October, 1950.

(G 264)

BRITISH ELECTRICITY AUTHORITY

Chief Engineer's Department, Headquarters

Transmission (Construction) Branch

SECOND ASSISTANT ENGINEERS

APPLICATIONS are invited for appointments as Second Assistant Engineers in the Co-ordination Section, Transmission (Construction) Branch at Headquarters in London.

Applicants should have engineering and educational qualifications not below those required for Associate Membership of the I.E.E., and should have experience of the preparation of specifications and of dealing with inquiries and tenders for works relating to 132 kV transmission, with particular reference to 132 kV and lower voltage switchgear. Practical experience of work on site and the general co-ordination of work on transmission schemes from the inception to ultimate commissioning is desirable.

Those appointed will be required to assist a Senior Assistant Engineer in the preparation of specifications and in the co-ordination of transmission construction work with the Authority's Divisions and with other Departments at Headquarters. They will be based at Headquarters in London, but their duties will entail visits to Divisions and sites in various parts of the country.

The starting salary for the appointments, which are superannuable, will be determined according to qualifications and experience within Grade 3 of the National Joint Board Agreement, £755-£1,017, rising ultimately to a maximum of £1,120 per annum, including London allowance.

Application forms may be obtained from D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, and should be completed and returned to him not later than October 21, 1950. Please quote reference AE/102.

(G 249)

BRITISH ELECTRICITY AUTHORITY

South Western Division

DEPUTY STATION SUPERINTENDENT—PORTISHEAD POWER STATION

APPLICATIONS are invited for appointment as Deputy Station Superintendent at Portishead power station, Class "J," Grade 3, £1,016-£1,066 per annum.

The successful applicant will be responsible to the Station Superintendent for the efficient operation and maintenance of the station and will be required to deputise for him in his absence. Applicants should have a wide experience in the operation, maintenance and administration of a large electricity power station.

Salary and conditions of service will be in accordance with the National Joint Board Agreement.

The appointment will be superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, qualifications, experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than October 16, 1950.

R. C. BARRETT,
Divisional Secretary.

September 27, 1950. (G 256)

NORTH WESTERN ELECTRICITY BOARD

No. 7 Sub-Area

APPOINTMENT OF FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER—"C" DISTRICT

APPLICATIONS are invited for the appointment of First Assistant District Commercial Engineer in "C" District of the No. 7 Sub-Area. "C" District includes the localities of Marple, New Mills, Chapel-en-le-Frith and Buxton.

Applicants should be experienced in the negotiation of all classes of sales and load development, lecturing, exhibition and demonstration work, consumers' records systems, contract wiring and repairs, installation and maintenance of appliances, and supervision of staff.

Corporate membership of the Institution of Electrical Engineers will be an advantage.

The salary will be in accordance with the National Joint Board Revised Schedule, Class "D," Grade 5, i.e. £641-£648-£655 per annum. The post is superannuable.

Applications, stating age, qualifications and experience, present post and salary, should be received by J. Harwood Lumsden, M.I.Mech.E., A.M.I.E.E., Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Electricity Offices, Chapel Street, Hazel Grove, Cheshire, not later than Saturday, October 21, 1950. (G 244)

NORTH WESTERN ELECTRICITY BOARD

No. 1 Sub-Area

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER—NORTH DISTRICT

APPLICATIONS are invited for the appointment of Second Assistant District Commercial Engineer in the North District of the No. 1 Sub-Area.

Applicants should have experience in the supervision and control of Sales Representatives, Service Centre Staff and demonstrators, and must be able to conduct personal negotiations in connection with the development of the domestic, commercial and industrial load.

The salary will be in accordance with the National Joint Board Revised Schedule, Class "F," Grade 7, i.e. £625-£634-£643 per annum.

Applications, stating age, qualifications and experience, present post and salary, should be received by the Sub-Area Secretary, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, not later than Saturday, October 21, 1950. (G 243)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the position of MAINTENANCE ENGINEER (Mechanical) at the new Agecroft Generating Station, Pendlebury, near Manchester.

The present capacity of the station is two 52·5 MW sets, and the ultimate capacity will be 210 MW.

The post is superannuable and the salary will be in accordance with Grade 6, Class "G," i.e., £707 to £737 per annum.

Applicants should have sound technical qualifications, and practical experience in the maintenance of h.p. boilers and turbines. A practical knowledge of p.f. plant would be an advantage.

Applications, stating age, present position, and giving full details of qualifications, education, and experience, should be received by The Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than October 21, 1950. (G 295)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of SENIOR ASSISTANT (Industrial Development) in the Commercial Department of the Eastern Sub-Area of the Board, based on Newport, Mon.

The post entails the development of supply of electricity throughout the Sub-Area to a wide range of industries, including large steel works and chemical plants, collieries, etc. Experience in the assessment of load magnitude and character, and negotiation of contracts is essential, coupled with the ability to advise consumers on the applications of electricity to industrial processes.

The salary for the position will be in accordance with Class "H," Grade 4 (£878-£896-£918) of the National Joint Board Schedule for the Electricity Supply Industry.

Preference will be given to applicants who possess a degree in engineering of a British university and/or corporate membership of the Institution of Electrical Engineers.

Applications, stating age, present position, present salary, qualifications, and experience, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments Section), The South Wales Electricity Board, St. Mellons, Nr. Cardiff, so as to reach him not later than October 14, 1950. (G 293)

EASTERN ELECTRICITY BOARD

APPOINTMENT OF ASSISTANT IN THE LIAISON AND PERSONNEL OFFICER'S DEPARTMENT

APPLICATIONS are invited from suitably qualified candidates for the position of Assistant in the Liaison and Personnel Officer's Department at Area Board Headquarters, Wherstead, Ipswich, to deal, among other matters, with the administration of schemes for the education and training of apprentices and junior staff.

Applicants must have had a sound general education, possess good organising ability, and have had experience of joint consultation work, either in the electricity supply industry or in a large industrial concern.

The salary will be in accordance with Grade 8 (Principal Assistants) of the N.J.C. Scales, commencing at £795 per annum, and rising by annual increments of £35 to £900 per annum. The conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may have to undergo a medical examination.

Applications should be sent to the Liaison and Personnel Officer, Eastern Electricity Board, Wherstead, Ipswich, to arrive not later than Monday, October 30, 1950.

30th September, 1950. (G 294)

GOVERNMENT OF IRAQ

MECHANICAL AND ELECTRICAL ENGINEER required by the Directorate General of Municipalities, Iraq, for a tour of two years in first instance. Salary of not less than I.D. 150 a month, plus cost-of-living allowance of between I.D. 10 and I.D. 14 a month according to dependents. (I.D.1 equals £1.) The post is non-pensionable but there is a Provident Fund. Free passages. Candidates must be corporate members of the Institution of Mechanical Engineers and the Institution of Electrical Engineers, or possess one of these qualifications and have a sound technical knowledge and suitable experience in both electrical and mechanical engineering. They must be capable of undertaking the design of a.c. and d.c. public lighting systems and be fully acquainted with the installation, maintenance and operation of diesel electric generating plants and electrically driven pumping units, and the layout and construction of h.t. and l.t. overhead lines.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents, 4 Millbank, London S.W.1, quoting M/N 24894(3B) on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (G 290)

LONDON ELECTRICITY BOARD

DEVELOPMENT ASSISTANTS

APPLICATIONS are invited for positions as Development Assistants in several districts of South-West London.

Applicants are required to have a knowledge of service to consumers, tariffs and their application. They should be familiar with electrical apparatus, and be capable of advising consumers on domestic and small commercial and industrial installations.

The posts are graded within the permanent agreement of the National Joint Council (Administrative and Clerical Grades) as Grade 1, i.e. £310 to £390 per annum, plus the appropriate London area allowance.

Application forms from Establishments Officer, 46 New Broad Street, E.C.2, on receipt of addressed foolscap envelope, to be returned, duly completed by 14th October, 1950. Please quote ref. EST/V/988/T on all correspondence. (G 284)

MIDLANDS ELECTRICITY BOARD

Wolverhampton & District Sub-Area—Cannock District

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Cannock District of the Board.

Applicants must have had a good general experience in all branches of distribution work and particularly in the construction and maintenance of 11 kV, 66 kV and medium voltage overhead lines, in which work they will be predominantly engaged. Preference will be given to applicants who have had extensive experience in overhead mains work and rural electrification, and appropriate technical qualifications will be considered an advantage. The appointment will be in accordance with N.J.B. conditions and the provisional salary subject to negotiation will be £550 per annum.

Applications, stating full details of age, experience, qualifications and present salary, should be sent within 14 days to Mr. F. J. Elliott, Sub-Area Manager, Wolverhampton and District Sub-Area, 83 Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary.
(G 296)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

DEPUTY POWER STATION SUPERINTENDENT
BLACKBURN MEADOWS POWER STATION

APPLICATIONS are invited for the appointment of Deputy Power Station Superintendent at Blackburn Meadows Power Station, Sheffield.

Applicants should have had a good technical education, practical experience in the operation, maintenance and administration of a modern power station, and should be corporate members of one of the recognised professional institutions.

Conditions of service and salary will be in accordance with the National Joint Board Agreement, Class "H," Grade 3, £948 to £994 per annum. The appointment will be subject to the provisions of the authority's superannuation scheme.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds 7, to whom completed forms should be returned within ten days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(G 292)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:—

STATION SHIFT CONTROL ENGINEER
Bedford Generating Station

Salary in accordance with the revised N.J.B. Schedule, Grade 10, Class "D," (£465–£481 per annum).

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering or its equivalent, have experience in the operation of a switchboard at a generating station and be fully conversant with high tension switching operations and protective systems.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, experience and present position, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than October 13, 1950. Envelopes should be endorsed "Station Shift Control Engineer—Bedford."

W. N. C. CLINCH,
Controller.
Northmet House, Southgate, N.14. (G 230)

SOUTH EASTERN ELECTRICITY BOARD

Woking District

JUNIOR ENGINEER

SALARY, £375 to £397 per annum under Class "E," Grade 14, of the N.J.B. Agreement. Applicants should have experience in an electricity distribution department and should preferably hold the Higher National Certificate or equivalent qualification. The successful candidate will be largely responsible for keeping mains records and generally assisting the district engineers. Applications, giving two referees, must reach F. Woods, Esq., M.B.E., M.I.E.E., Woking Manager, South Eastern Electricity Board, Chobham Road, Woking, Surrey, by October 11, 1950.

A. L. BURNELL,
Secretary.
September, 1950. (G 283)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

REGIONAL ENGINEER (PROTECTION), COVENTRY
SECTION OF THE TECHNICAL DEPARTMENT

APPLICATIONS are invited for the position of Regional Engineer (Protection) in the Coventry Region of the Divisional Technical Department.

Applicants, who should possess the regular National Certificate, or preferably a Degree in Electrical Engineering, must have had considerable experience in the testing and commissioning of protective gear.

The salary and conditions of service will be in accordance with the Revised National Joint Board Schedule, Class "AX," Grade 5, the salary range being from £579 to £710 per annum.

The appointment will be subject to the provision of the British Electricity and Area Boards' Superannuation Scheme.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, British Electricity House, Barker Gate, Nottingham, and should be returned not later than October 23, 1950.

W. S. BURGE,
British Electricity House, Divisional Controller,
Barker Gate, Nottingham. (G 245)

BRITISH ELECTRICITY AUTHORITY

Chief Engineer's Department Headquarters

DEPUTY GENERATION DESIGN ENGINEER

APPLICATIONS are invited for the appointment of Deputy Generation Design Engineer in the Chief Engineer's Department at Headquarters in London.

The salary for the appointment, which is superannuable, will be within the provisional range £2,250–£2,500 per annum.

Candidates should be Corporate Members of the Institution of Electrical or Mechanical Engineers, and should have wide experience in the planning, design, layout and construction of large modern generating stations. A sound knowledge of engineering economics is also essential.

The successful candidate will be required to take charge under the Generation Design Engineer of the Station Development, Plant Layout, Civil Engineering, Hydro-electric and Plant Design Sections of the Branch.

Applications, stating age, and giving full details of training, qualifications and experience, should be forwarded to D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, so as to be received not later than October 21, 1950. Please quote reference AE 100.
(G 248)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the position of STATION CHEMIST at the new Agecroft Generating Station, Pendlebury, near Manchester.

The post is superannuable, and the salary, which is provisional pending negotiations, will be £651 to £679 per annum, in accordance with Grade 7, Class "G," of the N.J.B. Agreement.

Applicants, who should have had experience in the chemical testing of coal, water, and oil, in connection with power plant, should preferably hold a degree of a British university, or be an associate of the Royal Institute of Chemistry. Consideration will be given to those with the Higher National Certificate and who are studying for the A.R.I.C. or equivalent examination.

Applications, stating age, qualifications, present position, and giving full details of education and experience, should be received by The Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than October 21, 1950. (G 288)

EASTERN ELECTRICITY BOARD

Chief Engineer's Department

PURCHASING ASSISTANT

APPLICATIONS are invited from suitably qualified candidates for the position of Purchasing Assistant in the Chief Engineer's Department at Area Headquarters, Wherstead, Ipswich.

Applicants should have experience in large-scale purchasing of engineering and commercial electrical equipment and stores procedure.

The salary will be in accordance with Grade 9 of the N.J.C. Scales, commencing at £900 per annum and rising by annual increments of £40 to a maximum of £1,020 per annum. The conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may have to undergo a medical examination.

Applications should be made on forms to be obtained from the Chief Engineer, Eastern Electricity Board, Wherstead, Ipswich, to whom they should be returned, duly completed, so as to arrive not later than Monday, October 30, 1950. (G 297)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Area Board Headquarters, Chief Engineer's Department System Design

SECOND ASSISTANTS (two vacancies)
(Vacancy No. 60/50).

Applicants must have wide experience in the electrical supply industry and have ability in preparation of technical reports and digests of data. They must also possess an honours degree in electrical engineering and be Corporate Members of the Institution of Electrical Engineers.

Experience in at least four of the following branches is necessary:

(*a*) Design and development of distribution systems.
(*b*) Research on design and economics of electrical distribution up to 66 kV.
(*c*) Network calculations.
(*d*) Application of protective gear.
(*e*) Manufacture of electrical plant.
(*f*) Layout and construction of 66 kV and 33 kV networks and substations.
(*g*) Maintenance and operation of 66 kV and 33 kV networks.
(*h*) Application and utilisation of electric power.
(*i*) Statistical treatment of data.

Salary: N.J.B. Agreement, Schedule "C AX2," £752/£884 rising to £966 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, within 14 days of the appearance of this advertisement.

No. 2 (Huddersfield) Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
(HALIFAX DISTRICT)
(Vacancy No. 45/50)

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications, and must have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary apparatus.

Salary: N.J.B. Agreement, Class "F," Grade 7, £625/£643 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, within fourteen days of the appearance of this advertisement.

No. 7 (Grimsby) Sub-Area

SECOND ASSISTANT ENGINEER—DISTRIBUTION DESIGN
(Vacancy No. 57/50)

Applicants must have had a sound practical training and considerable experience in the operation, maintenance, planning, and construction of high- and low-voltage underground and overhead networks, substation plant, and ancillary apparatus. Preference will be given to candidates who are Corporate Members of the Institution of Electrical Engineers, or who hold an engineering degree, or equivalent qualification.

Salary: N.J.B. Agreement, Class "G," Grade 7, £651/£679 per annum.

SECOND ASSISTANT DISTRICT ENGINEER
(GRIMSBY DISTRICT)
(Vacancy No. 47/50)

Applicants must have had a sound practical training and considerable experience in the operation, maintenance, planning and construction of high- and low-voltage underground and overhead networks, substation plant, and ancillary apparatus. Preference will be given to candidates who are Corporate Members of the Institution of Electrical Engineers, or who hold an engineering degree, or equivalent qualification.

Salary: N.J.B. Agreement, Class "E," Grade 7, £579/£609 per annum.

Applications, stating the above vacancy numbers, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, within fourteen days of the appearance of this advertisement. (G 285)

ALFRED BIRD AND SONS LTD., Birmingham, wish to appoint a CONSUMER SERVICE ADVISER. Candidates should possess as a minimum a teacher's diploma in Domestic Science, and preferably have additional qualifications with ample practical experience in the duties concerned. These are very comprehensive and include all consumer relations and recipe development for the company's products. Organising ability essential and residence in Birmingham would also be necessary. The position carries ample scope for development.—Applications, in writing, should be addressed to Personnel Manager, and give full details of age, education, experience and salary range expected. (G 236)

BRITISH ELECTRICITY AUTHORITY

South Western Division

DEPUTY STATION SUPERINTENDENT
NEWTON ABBOT POWER STATION

APPLICATIONS are invited for appointment as Deputy Station Superintendent at Newton Abbot Power Station, Class "F," Grade 3, £827-£965 per annum.

The successful applicant will be responsible to the Station Superintendent for the efficient operation and maintenance of the station and will be required to deputise for him in his absence. Candidates should preferably be Corporate Members of the Institution of Mechanical Engineers, the Institution of Electrical Engineers, or hold equivalent qualifications.

Salary and conditions of service will be in accordance with the National Joint Board Agreement.

The appointment will be superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, qualifications, experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than October 12, 1950.

R. C. BARRETT,
Divisional Secretary.
September 21, 1950. (G 220)

AN interesting and progressive position exists for a qualified ELECTRICAL ENGINEER, in connection with the design and development of servo and electro magnetic equipment for aircraft.—Apply, giving age, details of experience and salary required to Mr. G. Orloff, Chief Designer, British Messier, Ltd., Cheltenham Road East, Gloucester. (G 233)

APPLICATIONS are invited for a number of vacancies for ELECTRICAL ENGINEERING SENIOR DRAUGHTSMEN for the installation of electrical equipment in large civil and military aircraft. Some knowledge of electronic equipment is desirable and possession of O.N.C. or H.N.C. (Elect.) preferable. The vacancies are for Cricklewood and Radlett (Herts.) drawing offices. Further vacancies exist at Cricklewood only for Junior Electrical Engineering Draughtsmen for detailing the above work. Applications from trainees wishing to take up a career in aircraft electrical installation work will be considered. The positions offer excellent opportunities for advancement to keen men. Write, stating age, and full details of experience and qualifications, to : Staff Officer, Handley Page, Ltd., Cricklewood, London N.W.2. (G 260)

ARMATURE WINDER (FOREMAN) wanted for small shop, N.E. Scotland. Good pay and conditions to right man.—Box No. 1763, Electrical Times. (G 267)

ASSISTANT ELECTRICAL ENGINEERS required for Ceylon, with experience in estimating and supervising all classes of electrical installations. Age not exceeding 30 years. Applicants required to write details, experience and copies any testimonials.—Box Z.P.165, Deacon's Advertising, 36 Leadenhall Street, E.C.3. (G 280)

BRITISH ENGINE, BOILER & ELECTRICAL INSURANCE CO., LTD., 98 West George Street, Glasgow. The company has vacancies for ELECTRICAL PLANT INSPECTORS in the Glasgow, Ayrshire and Grangemouth areas. Permanent positions, carrying progressive salary scale, £450 to £650, and non-contributory pension. Candidates, age 26 to 32 years, with apprenticeship in the manufacture of electrical machinery and preferably with subsequent experience of repairs and industrial use of electrical machinery, and who have gained the Higher National Certificate in Electrical Engineering or are Grad.I.E.E., are invited to apply, in own handwriting, stating age, qualifications, and experience. (G 276)

CONTROL ENGINEERS

CONTROL ENGINEERS for network operation required by Major Oil Company in Middle East for control centre covering operation of extensive overhead and underground transmission and distribution networks up to 66 kV. Applicants must possess Ordinary or Higher National Certificate in Electrical Engineering, and must be experienced in the operation of indoor and outdoor metal-clad switchgear at all voltages, transformers and associated substation equipment. Age not over 35. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements, Pension Scheme.—Write, giving personal particulars and details of qualifications and experience, quoting:

DEPARTMENT F.116 TO BOX NO. 2584 AT 191 GRESHAM HOUSE, E.C.2. (E 399p)

DRAUGHTSMEN with experience in cable, power, and lighting installation layouts for industrial works. Salaries in accordance with ability and experience. Staff profit-sharing scheme and pension fund.—Apply, stating age and full particulars of experience, to Chief Engineer, The Associated Portland Cement Manufacturers, Ltd., Portland House, Tothill Street, Westminster, London S.W.1. (G 179)

ELECTRICAL DRAUGHTSMAN required for work on new distribution system with possibility of permanency for suitable man. Experience of large industrial plant electrical layouts, diagrams and specifications is desirable.—Applications, giving age, personal particulars and experience, to be addressed to National Oil Refineries, Limited, Llandarcy, Neath, Glamorgan. Envelope to be marked "Electrical Draughtsman." (F 727)

ELECTRICAL DRAUGHTSMAN required by major oil company for service in the Middle East. Must have served five years electrical engineering apprenticeship, and have had five years D.O. experience in connection with electrical layouts of large industrial plants with underground cable networks. Should possess Higher National Certificate. Graduate or associate membership of a corporate engineering body desirable but not essential. Maximum age limit 35 years. Attractive salary plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme.—Write, giving personal particulars and details of qualifications and experience, quoting Dept. F.192, to Box No. 2809, at 191 Gresham House, Old Broad Street, E.C.2. Applicants without above requirements will not be considered.(F 322)

ELECTRICAL ENGINEER (OR MANAGER) required for iron and steel works.—Applications, giving age, experience, etc., and including photograph, should be submitted, together with salary required, to Box No. 1737, Electrical Times. (G 205)

ELECTRICAL ENGINEERS required for service in Middle East. Applicants should (a) possess Ordinary or Higher National Certificate and have had full apprenticeship with heavy electrical equipment manufacturers or with a large colliery or allied fully electrified industry or (b) possess a degree and have had two years' technical apprenticeship with similar firm to above. In each case applicants must have had at least three years' subsequent experience on the installation and maintenance of heavy electrical equipment. Maximum age limit 35 years. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme.—Write, giving particulars and details of qualifications and experience, quoting Dept. F.191, to Box No. 2916 at 191 Gresham House, E.C.2. (G 19)

ELECTRICAL ENGINEER required in London area. Able to introduce business and estimate, etc.—Write full particulars of experience and salary required to Box No. 1761, Electrical Times. (G 266)

ELECTRICAL ENGINEER (young) with some experience of layout of industrial electrical equipment, foundations and cabling required by the Loewy Engineering Co. Ltd., Branksome Grange, St. Aldhelms Road, Westbourne, Bournemouth. (G 259)

ELECTRICIAN, used to wiring a.c. and d.c. electric drives, principally printing machines, power and lighting. Willing travel British Isles.—Write, Box No. 1765, Electrical Times. (G 268)

EXPERIENCED ESTIMATING ENGINEERS, capable preparing tenders for electrical rotating plant and attendant apparatus.—Applications, stating age and salary expected, to Personnel Manager, Lancashire Dynamo & Crypto, Ltd., Trafford Park. (G 302)

IMPERIAL CHEMICAL INDUSTRIES, LTD., Alkali Division, has vacancy ELECTRICAL DRAUGHTSMAN. Higher National (Electrical) or equivalent. Capable of making good layout drawings for industrial electrical equipment and distribution schemes. Salary according to age and experience. Housing available for certain applicants within three months after starting.—Applications, Staff Manager, Imperial Chemical Industries, Ltd., Alkali Division, Winnington, Northwich, Cheshire. (G 277)

LARGE old-established and well-known Scottish manufacturing firm require TRANSFORMER SALES ENGINEER, initially for position inside for the preparation of tenders for all types of transformers, large and small, for the home and export markets, and ultimately for appointment to the outside sales staff in England. Good technical and commercial transformer engineering experience is essential. Connection with power supply authorities, consultants, etc., a recommendation. State age, experience, and present salary.—Box No. 1757, Electrical Times. (G 252)

REPRESENTATIVE OR AGENT required by firm of repute to sell additional lines on commission basis. Applicants should have good existing connections and represent first-class houses. Full support given. Territory available in several parts of United Kingdom. State full particulars in confidence. Interview arranged in your own territory.—Box No. 1767, Electrical Times. (G 269)

NEW SWITCHGEAR CONSTRUCTION CO., LTD., Sutton, Surrey, have vacancies for SENIOR DRAUGHTSMEN with up-to-date experience of h.t. switchgear. State qualifications, age and salary required. (G 183)

POWER STATION OR MARINE ENGINEERS. Applications are invited by The Calcutta Electric Supply Corporation, Limited, for appointment to the posts of SHIFT CHARGE ENGINEERS in Calcutta where the company has three generating stations each over 100 MW capacity. Candidates must either have had responsible operating experience in modern large high-pressure steam generating stations, or alternatively must have had marine experience with high pressure water tube boilers and turbines and must hold a 1st class Board of Trade Engineering Certificate; such candidates without previous power station experience would be required, if selected, to undergo a course of training in the U.K. before proceeding to Calcutta. The appointments are permanent and selected candidates will be required to sign an agreement for three years. The monthly salary is in the scale Rs.900-45-1,035 (efficiency bar), 1,075-50-1,275; plus overseas pay minimum Rs.200 monthly; plus overseas marriage allowance Rs.250 monthly (the present rupee exchange is 1s. 6d.). There are in addition other generous allowances including overseas child allowance and cost of living allowance. In addition free furnished quarters are provided, as is also free medical attention. Liberal leave and passage rules, contributory provident fund, etc. Applications, giving age (about 35 to 40 preferred), details of training, experience, present position held, should be addressed to the Secretary, Calcutta Electric Supply Corpn., Ltd., Victoria House, Vernon Place, Bloomsbury Square, London W.C.1. (G 159)

REQUIRED for New Zealand. SALES ENGINEER, take charge of department handling electrical accessories, motors, switchgear, etc. Must have had technical and sales experience, first-class qualifications. Salary, commission and passage. Age not exceeding 32 years.—Apply in writing, Nathan & Allen, Ltd., 131 Victoria Street, London S.W.1. (G 282)

SENIOR AND JUNIOR ELECTRICAL DESIGNERS, experienced in all classes of a.c. and d.c. dynamo electric machines from 5 to 5,000 h.p./kW. Five-day week. Superannuation scheme in operation.—Applications, stating age, experience, and salary expected, to Personnel Manager, Lancashire Dynamo & Crypto, Ltd., Trafford Park. (G 303)

SENIOR DESIGNER, with industrial and/or traction motor control design experience, wanted by progressive manufacturer to engineer new control gear development. Salary £700 per annum.—Full particulars to Box No. 1753, Electrical Times. (G 250)

SENIOR ELECTRICAL DRAUGHTSMEN required by established British firm with American affiliation. Experience of power distribution and lighting installations, as applied to the oil refinery and chemical industry, essential. Qualifications to H.N.C. standard. Substantial salaries will be paid to suitable applicants.—Write, stating age, qualifications and experience, Foster Wheeler, Ltd., 3 Ixworth Place, London S.W.3. (G 212)

TECHNICAL ASSISTANT for interesting work in small laboratory engaged in development of mass-produced electrical switchgear and control devices in modern West London factory. Minimum qualifications, Ordinary National. Laboratory experience essential.—Box No. 1723, Electrical Times. (G 175)

TECHNICAL ASSISTANT required in Electrical Department of large works in the north-west.—Applications, giving age, details of education, experience, positions held (with dates), and including photograph, should be submitted, together with salary required, to Box No. 1733, Electrical Times. (G 190)

TEST SUPERINTENDENT required by rubber cable manufacturers in Middlesex. Full responsibility for all electrical tests up to 10/20,000 V. Applicant should be conversant with recognised rubber cable specifications. —Write, stating age, experience and salary required, to Box No. 1759, Electrical Times. (G 257)

THE GENERAL ELECTRIC COMPANY invites applications for the position of INSTALLATION ENGINEER at their branch in Hong Kong. Applicants should be between 22 and 30 years of age and preferably single. Qualifications required are an apprenticeship in the electrical contracting industry followed by estimating experience; a Higher National Certificate is desirable.—Apply, giving particulars of age, training and experience, to Staff Manager, Magnet House, Kingsway, London W.C.2. (G 240)

THE GENERAL ELECTRIC COMPANY, LTD., invites applications for the position of ASSISTANT ELECTRICAL ENGINEER on the staff of their agents in Ceylon. Applicants should be between 22 and 30 years of age and be preferably single. Qualifications required are a Degree of Higher National Certificate in electrical engineering, together with an apprenticeship in the electrical manufacturing or contracting industries. Some sales experience an advantage.—Apply, giving particulars of age, education and experience, to Staff Manager, The General Electric Company, Ltd., Magnet House, Kingsway, W.C.2. (G 241)

APPOINTMENTS WANTED

ELECTRICAL DESIGNER DRAUGHTSMAN (33) seeks new appointment. National Certificate, excellent knowledge of electrical engineering, specialising in super tension, impregnated pressure cable on board and in the field.—Box No. 1711, Electrical Times. (G 160)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines). Service Electric Co., Ltd., Stanmore, Middx. (D 324)

ARMATURE SERVICE CO., LTD., Haddington Street, Hove (Tel. 32996), electrical engineers and winding specialists. Distance no object. (F 739)

CASTINGS. Fisher Foundries, Ltd., Greet Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts Tel.: B'ham, Victoria 0197. (F 270)

GUARANTEED, high quality Stator and Armature Re-winds, F.H.P. motors, portable tools, etc. Contract rates available.—Sarum Electric, Ltd., Brown Street, Salisbury. Tel. 4245. (G 52)

STOP WATCHES REPAIRED at a reasonable price. 12 months' guarantee.—J. W. Hughes, Clockwork Engineers, 3 St. Thomas' Street, London Bridge, S.E.1. Tel.: Hop. 2759. (G 164)

ZEROS REFRIGERATORS.—Complete range of repair and service now available. Equipment reconditioned to conform to pre-war manufacturers' specifications.—Time Engineers, Refrigeration Specialists, 60 Southend Road, Rainham, Essex. Tel.: Rainham 2358; or Southern Area Agency. Tel.: Springpark 4217. Electrical Spares supplied to the trade. (A 639)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5105. (A 20)

WANTED, DIESEL GENERATING SET, 27 or 30 kVA, 400/440 V, 3-phase, complete with switch panel.—North Electrical and Refrigeration Co., Ltd., 177 High Street, Northfleet, Kent. (G 301)

WANTED.—D.C. and a.c. ball-bearing MOTORS.—Full details to Britannia Manufacturing Co., Ltd., 22/26 Britannia Walk, London N.1. (A 13)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady St., Bethnal Green, E.1. (A 1)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

WESTALITE TROLLEY TYPE EX-R.A.F. RECTIFIERS. N.B.: *In September 21 issue the word WESTALITE was incorrect printed as Westolite.* Output 12 or 24 V high amperage input 400/3/50. These equipments are a black steel box with pram type handle, mounted on four small rubber tyred wheels; dimensions approx. 3 ft. 6 in. long, 2 ft wide, 3 ft high.—Staravia, Blackbushe Airport, Camberley, Surrey. (G 270)

AGENCIES

AGENT, with over 20 years' experience, calling on wholesalers, etc., open to handle any good proposition. Office and store available in centre of Leeds. Able to pioneer and hold existing accounts.—Box No. 1769, Electrical Times. (G 296)

WELL-KNOWN Switchgear and Motor Control Gear manufacturers, manufacturing motor control gear from ¼ to 5,000 h.p. and switchgear from 50 to 5,000 amperes require AGENTS for the Midlands area. Must have technical knowledge and established connection with industrial concerns in the area. Payment on retaining fee and commission basis.—Box No. 1735, Electrical Times. (G 193)

FOR SALE

SALE BY AUCTION

AT 4 CONDUIT COURT, LONG ACRE, LONDON W.C.2.
On WEDNESDAY, OCTOBER 11, at 10.30 a.m.
STOCK OF A LARGE ELECTRICAL AND PLUMBING CONTRACTOR
comprising:

1,500 PIECES IRONCLAD SWITCH AND FUSE GEAR to 500 AMPS
200 Bulkhead Fittings, 60 heavy Junction Boxes, 150 Dugdale Brackets, Conduit Fittings
500 BENJAMIN AND G.E.C. SHADES
Switchplugs, Thermostats, Indicator Boards, Test Meters, 5 Bridge Meggers, 35 Large Electric Exhaust Fans, Ceiling Ditto, 2 tons Jointing Compound, Panel Heaters, Electric Boilers, Cable, 400 Loudspeakers, Large quantity small Accessories.
25 A.C. MOTORS, 1 to 15 h.p.
Also 1,000 gross Screws, ton Nails, Lagging, 2 ton Pipe Fittings, Metal Valves, ton Nuts and Bolts, ½ ton Brackets, Bath and Lavatory Fittings, Gaskets, Pumps, 5 sets Lifting Tackle and various Ironmongery, Air-compressors, Air Line Valves, Petrol Meters, Hillman and Ford Spares.

On view day prior and morning of sale.
Catalogues of the Auctioneers:
WEST CENTRAL MERCHANDISE MART
1 CONDUIT BUILDINGS, FLORAL STREET, LONDON W.C.2
Tel.: TEMple Bar 0233/4. 'Grams: Loudsigs, Rand, London (G 111)

By Order of the Minister of Supply.
G R
NO. 1 R.E. SUB-DEPOT, SOUTH LITTLETON, NEAR EVESHAM, WORCS.
Important Sale by Auction of
GOVERNMENT SURPLUS PLANT AND STORES
Including 21 Concrete Mixers, Aveling Barford 5-ton Road Roller, Hyster 2½-ton Crane, Road Scrapers, Dynamos, Generating Sets, 18 five-ton Gritting Machines, 2 Schramm Compressors with diesel engines.
77 DECAUVILLE LOCOS
750 Decauville Side-tipping Trucks, Bogeys, and Trolleys
ELECTRICAL EQUIPMENT
Battery Charging Sets, Switches, Fuses, including Control Panels, Ceiling and Table Fans, Electric Light Bulbs and about
800 TONS OF WATER FITTINGS, 1,000 PAIRS OF BINOCULARS
Galvanised Wire Netting, Portable Batteries, Tubular Scaffolding, Wireless Equipment, Blackout Material.
Also lying at Depots at Long Marston and Wem:
5 STEAM CRANES, 14,500 L.T. Batteries, Gravity Roller Conveyors and Stands.
To be Sold by Auction by
E. G. RIGHTON AND SON
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View days: Monday, Tuesday, Wednesday, October 23, 24, and 25, from 10 a.m. till 4 p.m., and mornings of sale from 9 a.m. till 11 a.m.
Admission by catalogue only, price 6d. (P.O. only) (to admit two persons to view and one on sale days), may be obtained from the
AUCTIONEERS' OFFICES, EVESHAM, WORCS.
(Telephone 6155). (G 265)

DOMESTIC APPLIANCES

IMMERSION HEATERS. Grubb 4 kW. No purchase tax. All lengths, 18 in. to 36 in. Standard voltages. Provision for intermediate loadings. Fully guaranteed and immediate delivery. Write for illustrated brochure, latest lists and trade terms to distributors.—John Owner and Co., Ltd., Springfield Road, Birmingham 13. Tel.: Spr. 2939. (C 392)

2 KW 200/300 V, IMMERSION HEATERS, c/w. a.c./d.c. Thermostats and Flanges, 55/-, carriage paid. Cash with order.—Green Bros., Manor Road, Brackley, Northants. (G 278)

ENGINEERING PLANT & MATERIALS

A WELDING PLANT "LIBRARY" in Central London! We usually have a selection of welding plant taken in part-exchange against our "Rentweld" oil-cooled arc-welder, for hire or hire-purchase. If it's welding, consult Production Promotion, 94 Camden Road, N.W.1. Tel.: Gulliver 1255. (G 133)

COPPER TUBE for sale. 2 tons, ¾ in. outside diameter, 20's gauge, 18 ft. lengths.—S. S. Stott, Ltd., Hasling-den. (G 281)

CRANE, 2-ton, Telpher Hoist, cage controlled, 400 V, 3-phase, 50 c/s; guaranteed as new. Price £250 at works.—Viewed at F. A. Holt, Ltd., The Green, Darlaston. Tel.: Darlaston 531. (G 239)

LADDERS (wooden and aluminium, all types), Trestles, Steps, Handcarts, etc., from Ramsay and Sons (Forfar) Ltd., Forfar (Tel. 172). (C 603)

WELDING PLANT. Several Motor Generator Arc Welders, single, double and multi-operator up to 600 amps, input 400/440 V, 3-phase, 50 cycles. Also several single and double operator oil cooled transformer welders. All modern units by well-known makers. Attractive prices.—Full details write: Thos. W. Ward Ltd., Albion Works, Sheffield. (E 111)

GENERATING PLANT

"ALLEN" GENERATOR for sale, 125 kW, 250 V d.c., 500 amp, driven by 200 h.p. vertical diesel engine, compressed air starting, with compressor and slate panel, switchboard connections, tank. Inspect at works W. England. 4350.—F. J. Edwards, Ltd., 359 Euston Road, London N.W.1. (G 289)

ALTERNATORS from stock, 400/440 V, 3-phase, 50 c/s, with Exciters and switchboards. 80 kVA "GEC" 1,000 r.p.m. 40 kW "ECC," 750 r.p.m. 28 kVA "Crom-Park," 1,500 r.p.m.—Full details, write: Thos. W. Ward Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 109)

AVAILABLE FROM STOCK. Two 950 h.p. DIESEL ENGINES by Cammell Laird, 8-cylinder, 4-stroke, 300/460 r.p.m. One MOTOR CONVERTOR by Bruce Peebles. Input 6,600 V, 3-phase. Output 250 kW, 440/220 V d.c.—Bridgham, Graham and Co., Ltd., 108 Victoria Street, Belfast. (G 253)

DIESEL ALTERNATOR SETS in stock, standard voltages, single and three phase. Details post free on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ex 347). (E 108)

GENERATOR, complete with diesel motor manufactured by Alpha Harris Engineering, Ltd., Crossley V.R., 6-cyl. vertical engine, capacity 556·7 cubic in. or 47·3 h.p. rating. Generator: 30 kVA 1,500 r.p.m., 3-phase, 8-power factor, 50 c.s. 400/230 V, 43·3 amp, 40-V exciter; exciter 20 amp. Exciter details: D.C. generator, 1·2 kW, 2,350 r.p.m., 48 V, 25 amp. Complete with water tank and 500-gall. oil storage tank. Can be viewed by appointment to W. Straker, Ltd., 22-28 Shand Street, S.E.1. (G 300)

ONE 75 kW, 94 kVA, 1,000 r.p.m., 400 V, 3-phase, 50 c/s ALTERNATOR and EXCITER by E.C.C. Belt driven. —Advance Laundries, Limited, 19/20 Noel Street, London W.1. (G 254)

VALES PLANT REGISTER, LTD. (established 25 years) offer for sale:—

1—30 kVA Alpha Harris ALTERNATOR, suitable for 400/230 V, 3-phase, 50 cycles a.c., with switchboard.

1—50 kVA Alpha Harris ALTERNATOR, suitable for 400/230 V, 3-phase, 50 cycles a.c., with switchboard.

1—100 kVA Alpha Harris ALTERNATOR 400/230 V, 3-phase, 50-cycles, a.c., together with switchboard.

1—60 kW, 400 V, 3-phase, 50-cycle, 4-wire DIESEL ALTERNATOR SET, including Blackstone diesel engine, together with switchboard. Very little used.

1—84-b.h.p., 500-r.p.m. National VERTICAL DIESEL ENGINE.

Further particulars: 14 Lower Grosvenor Place, S.W.1. Tel.: Victoria 3501. (G 274)

1 ALTERNATOR, G.E.C. 6,500 kW 0·9 power factor 6·6 kV 3-phase 50 c.s. at 500 r.p.m. Two-bearing Alternator, complete with exciter and bed plate together with panel.—Apply: C. J. Rice, 137 Mayplace Road West, **Bexleyheath, Kent. Tel.: Bex. 3282.** **(F 494)**

100-kVA MODERN DIESEL ALTERNATOR SET, comp. Vert. 6-cyl. Diesel engine direct coupled to alternator on baseplate, 400/230 V, 3-phase, 50 cycles, 4 wire. Details on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ex 347). (E 112)

7,500-kW TURBO-ALTERNATOR by British Thomson-Houston, of the impulse type with a 2-stage Curtis wheel and 7 impulse stages, fitted with stainless steel and bronze blading and designed for use with steam at 180/200 lb/sq in., 550/574° F. temperature exhausting to a vacuum of 28 in., speed 300 r.p.m., and direct coupled on combined baseplate to 9,400-kVA alternator, 0·8 p.f., 6,300/6,900/3/50 with exciter. The surface condenser by W. H. Allen has cooling surface of 15,500 sq ft and is fitted with special brass tubes. Motor driven circulating pump and condensate pump are fitted, together with 2-stage steam jet air ejection. Auxiliary electric supply is 400/440/3/50.

Three Babcock and Wilcox WATER TUBE BOILERS, C.T.M. type, evap. 50,000 lb per hr each at 350 lb per sq in. w.p. Each complete with superheater, economiser, chain grate stokers, coal chutes, forced and induced draught fans, air heaters and accessories. Heating surface of each boiler 8,245 sq ft, superheater heating surface 3,135 sq ft, grate area 256 sq ft, economiser heating surface 4,907 sq ft, air heater 14,000 sq ft. Induced draught fan 45 in. diam., forced draught fan 30 in. diam.—George Cohen's, Wood Lane, London W.12 (SHE. 2070); and Stanningley (Pudsey 2241). (G 255)

LIGHTING EQUIPMENT

DRY CELL BATTERIES, "Siemens." 5¼ in. x 2 in. square, 1½ V. New. 12s. per dozen.—Farrows, Spalding. (G 168)

FLUORESCENT LAMPS AND CHOKES, Neon and other special lamps, British and American. Inquiries invited.—Suplex Lamps Ltd., 239 High Holborn, London W.C.1. (G 106)

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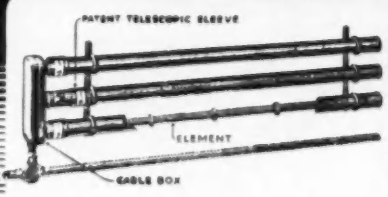

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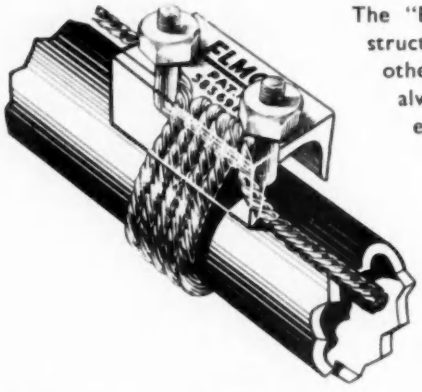

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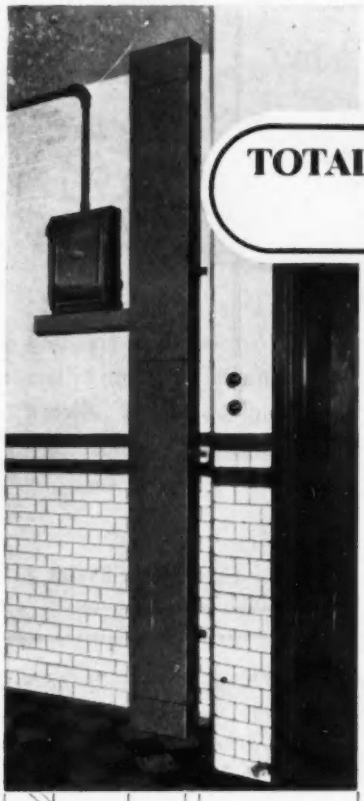

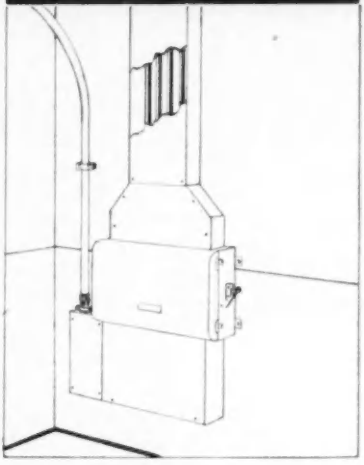

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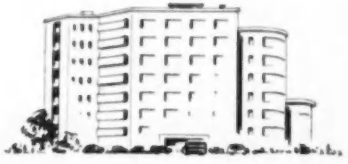

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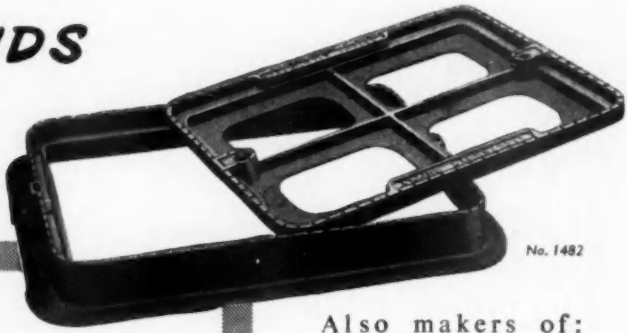

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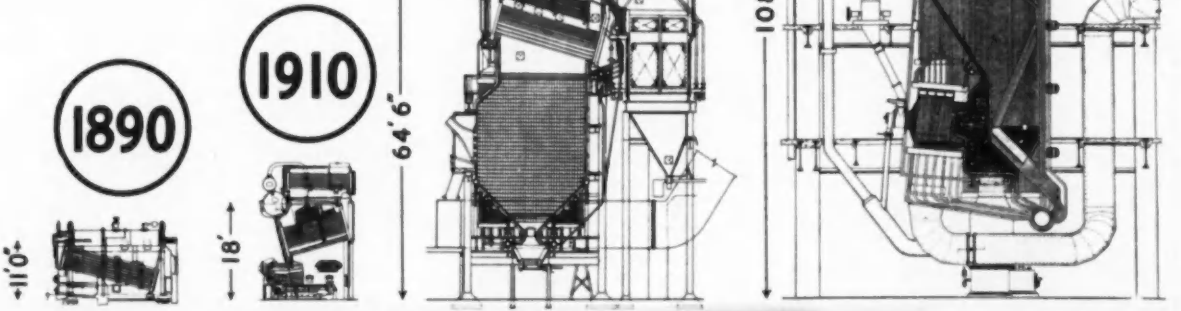

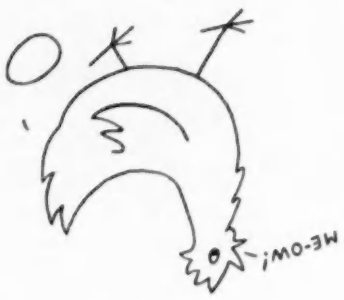

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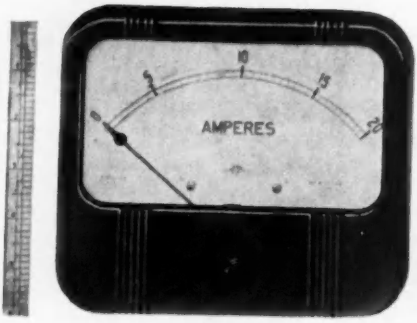

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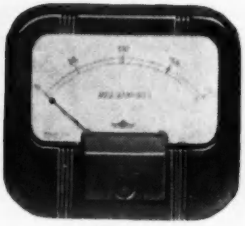

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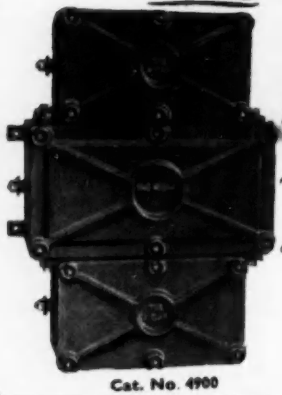

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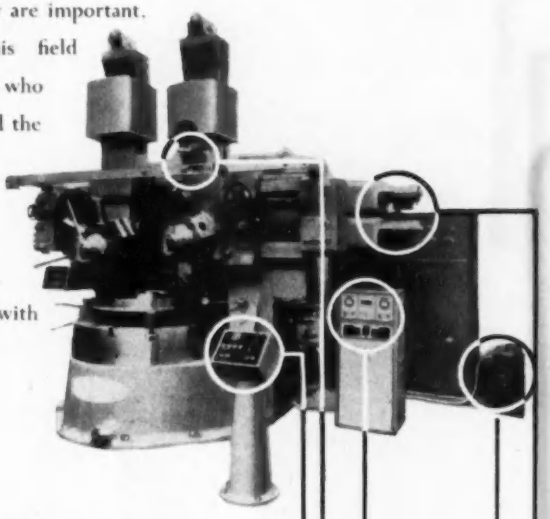

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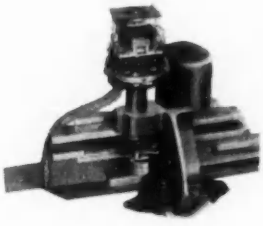

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A close up view of template and electro-magnetic tracer head with cover removed.

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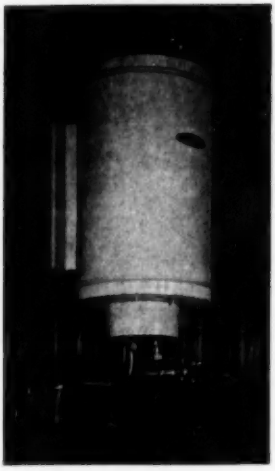

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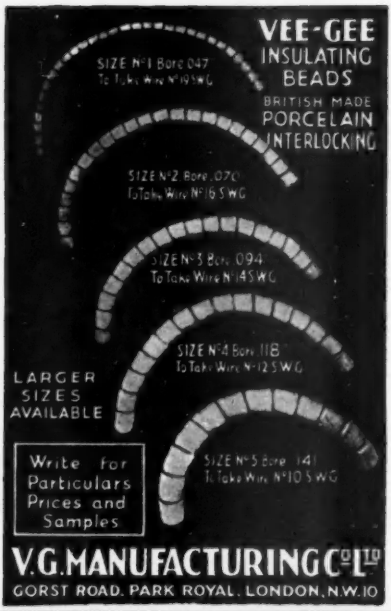

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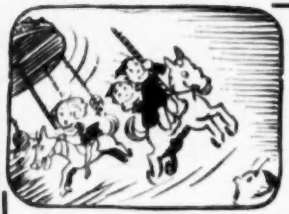

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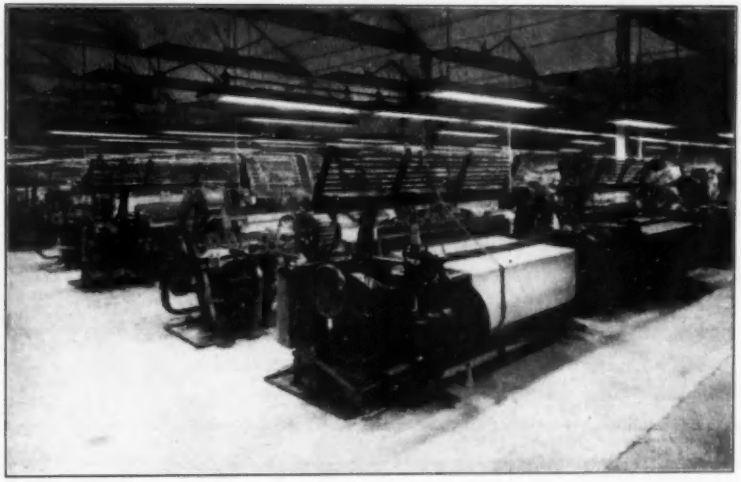

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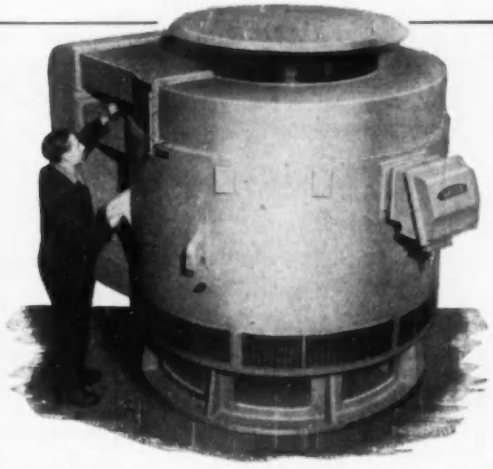

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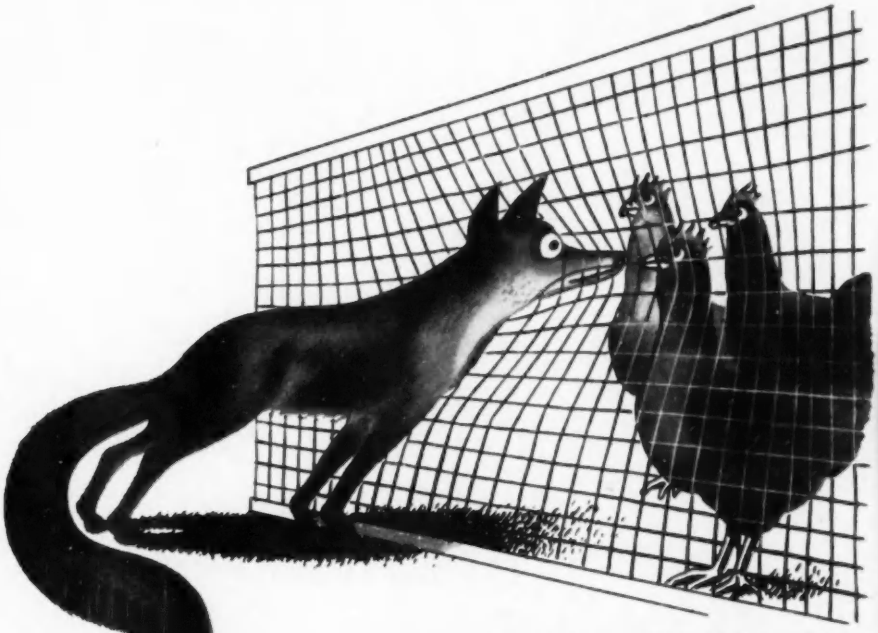

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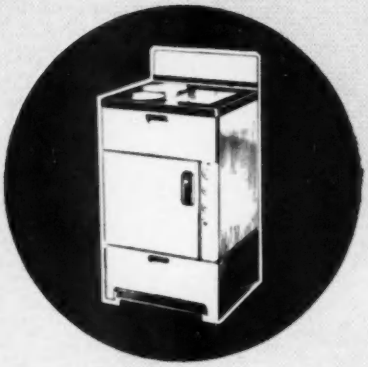

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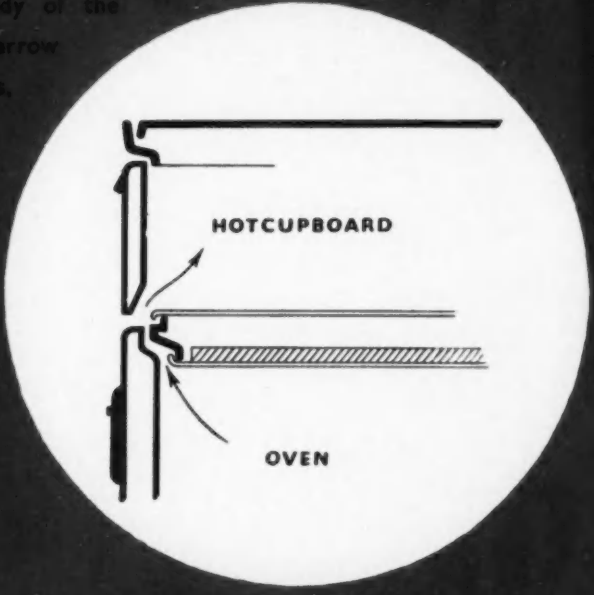

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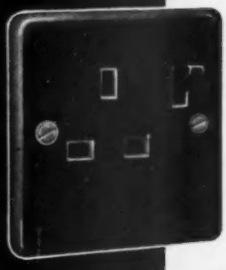

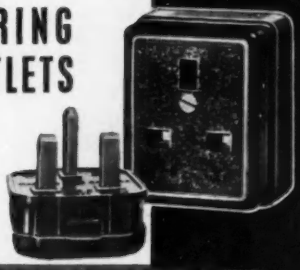

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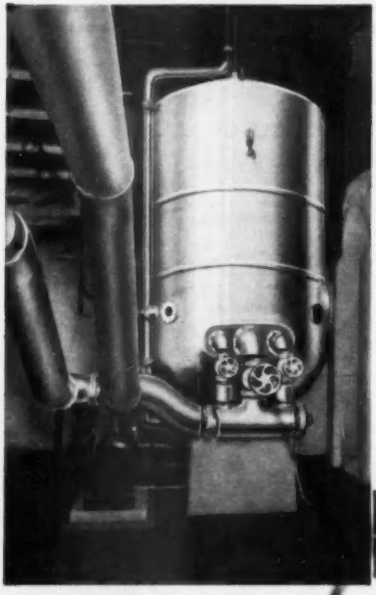

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